JOURNAL

OF THE

Elisha Mitchell Scientific Society

Volume 44 April, 1929 No. 2

FLORA OF THE TRYON REGION

AN ANNOTATED LIST OF THE PLANTS GROWING SPONTANEOUSLY IN POLK COUNTY, NORTH CAROLINA, AND ADJACENT PARTS OF SOUTH CAROLINA, IN GREENVILLE AND SPARTANBURG COUNTIES

Part II. Cat-Tail Family to Orchid Family (Typhaceae to Orchidaceae)

By Donald Culross Peattie

ANGIOSPERMAE (True Flowering Plants)

Family 9. TYPHACEAE (Cat-tail Family)

42. **Typha latifolia** L. (Cat-tail).

Infrequent, in such few artificial ponds as there are in the area, and probably of recent advent, spreading from the lowlands, but not deliberately introduced. Specimen: Erskine's millpond, July 23, 1921 (PT. no. 1054).

Family 10. POTAMOGETONACEAE (Pondweed Family)

43. **?Potamogeton foliosus** Raf. (Pondweed).

Found in Erskine's millpond, a sterile mass of pondweed which is either *P. foliosus* or close to it. Probably recently spreading into this region. Specimen: July 22, 1921 (PT. nos. 1065, 1066).

Family 11. ALISMACEAE (Water-plantain Family)

44. **Sagittaria latifolia** Willd. var. **pubescens** (Muhl.) J. G. Smith. (Arrow-head).
Sagittaria pubescens Muhl.

Around ponds and in low muddy ground around streams in the piedmont, probably spreading here recently from the lowlands.. Specimens: Erskine's millpond, July 23, 1921, and in ditches near Columbus, Aug. 20, 1921 (PT. nos. 1057–1059, 1336).

Family 12. GRAMINEAE (Grass Family)

45. **Arundinaria tecta** (Walt.) Muhl. (Switch Cane. Small Cane).
Arundo tecta Walt.

Common along the banks of streams in the piedmont, especially the sandy gravel beds, but also present along the courses of mountain streams where these flow quietly in interior valleys, and not unknown on moist shady hillsides, in the foothill region, well back from water. What appears to be a great colony of plants is often a single plant, the shoots of which are connected by an intricate tough tangle of rootstocks that almost defy any removal. But for this difficulty this would be a very handsome foliage plant for the garden, being the only native bamboo of the region, or, more strictly, member of the tribe *Bambuseae*. I have never seen a specimen in flower. Like all the bamboos, it delays flowering for an indefinite number of years, but when a shoot does flower, it dies. Specimen: Along Vaughan's Creek, March 21, 1919 (PT. 012).

46. **Festuca obtusa** Spreng. (Fescue Grass)
Festuca nutans Spreng.

Moist woods and thickets of the mountains and foothills. Specimens: Lynn and Skuyuka, May, 1899 (Church.). Tryon Mt., May 31, 1899 (Towns.). Beside a mountain spring, Melrose, June 27, 1921 (PT. no. 702).

47. **Festuca rubra** L. (Fescue Grass)

Plentiful in open sterile sandy soil. Specimens: Godshaw Hill, May 23, 1926 (PT. nos. 2212, 2218).

48. **Festuca octoflora** L. (Fescue Grass)
F. tenella Willd.

Frequent in waste ground, lawns, pathways, etc., possibly spreading into this neighborhood from the lowlands. Specimens: Along the railroad, north of Tryon, May 27, 1899 (Towns.). Roadsides, Tryon, May 18, 1911 (Day). Railroad track, also Godshaw Hill in lawn grass, May 23, 1926 (PT. nos. 2263, 2227).

49. **Festuca elatior** L. (Meadow Fescue)
F. poaeoides Michx.

Meadows and waste places, Tryon, April 18, 1919 (Day). Naturalized from Europe.

50. **Bromus secalinus** L. (Cheat. Chess)

A weed along the railroad track, naturalized from Europe. Specimen: May 11, 1926 (PT. no. 2181).

51. **Bromus purgans** L. (Brome Grass)

Frequent in mountain woods. Specimens: Side of Tryon Mt., June 4, 1899 (Towns.). In dry woods, Tryon, June 20, 1921. In rich woods, Tryon, June 20, 1921. On wet rocks, Skuyuka, July 21, 1921 (PT. nos. 650, 812, 813, 1029).

52. **Glyceria nervata** (Willd.) Trin. (Manna Grass)
Panicularia nervata Ktze.
Poa striata Michx.

In sand along small shaded streams. Specimens: Tryon, May 23, 1926 and June 27, 1921 (PT. nos. 2149, 693, 694).

53. **Poa annua** L. (Low Spear Grass)

Introduced from Europe, a lawn grass, spreading out to roadsides, etc. Specimen: Tryon, May 23, 1926 (PT. no. 2229).

54. **Poa cuspidata** Nutt. (Spear Grass)
P. brachyphylla Schultes
P. brevifolia Muhl.

A characteristic little grass of rich mountain woods and dripping crevices. Specimens: Near Columbus, 1897. On the side of the Tryon range, March 26, 1899; April 17, 1899. White Oak Mt., May 25, 1899 (Towns.). Tryon, April 18, 1919 (Day). Rich woods, Pearson's Falls, April 20, 1922, and on the dripping rocks at Pearson's Falls, April 10, 1923 (PT. nos. 1692, 1813).

55. **Poa pratensis** L. (Kentucky Blue Grass)

Introduced from Europe, frequent. Specimens: Tryon, May, 1918 (Millsp. no. 4170). Godshaw Hill, May 23, 1926 (PT. nos. 2226, 2241).

56. **Poa autumnalis** Gray (Spear Grass)
P. flexuosa Muhl.

Mountain woods, Skuyuka, May 25, 1899 (Church.).

57. **Eragrostis pilosa** (L.) Beauv.
Poa pilosa L.

Sandy soil in the mountains. Specimens: Side of Tryon Mt., June 20, and July 11, 1899 (Towns.). Summit of Hogback Mt., Nov. 16, 1926 (PT. no. 2364).

58. **Eragrostis minor** Host.
Poa Eragrostis L.
Eragrostis Eragrostis Beauv.

A handsome grass, naturalized from Europe, and found rarely in cultivated ground. Specimen: Tryon, Aug. 22, 1921 (PT. no. 1342).

59. **Eragrostis pectinacea** (Michx.) Steud.
Poa pectinacea Michx.

Along roadsides, frequent. Specimen: Tryon, Dec. 27, 1920 (PT. no. 1587).

60. **Uniola laxa** (L.) BSP. (Spike Grass)
Holcus laxus L.
Uniola gracilis Michx.

Frequent on moist banks and in shady woods of the piedmont.

Specimens: Tryon, Aug. 7, 1897 (Towns.). On moist banks at "The Shoals," Aug. 20, 1921. In shady woods near Clark's Mt., Aug. 15, 1921 (PT. nos. 1220, 1338.).

61. **Uniola latifolia** Michx. (Spike Grass)

Frequent in crevices of dripping mountain cliffs. A very handsome species. Specimens: "Near Columbus" but without further data (Towns.). Nodding from crevices of dripping rocks above Melrose, Aug. 8, 1921 (PT. nos. 1101, 1106, 1111).

62. **Dactylis glomerata** L. (Orchard Grass)

Introduced from Europe, frequent in meadows and ground. Specimen: Tryon, May 1918 (Millsp. no. 4134).

63. **Melica mutica** Walt. (Melic Grass)
M. diffusa Pursh.

A beautiful grass of the rich Porter loams in the mountains and foothills, conspicuous in spring. Specimens: Side of Tryon range, May 19, 1897 (Towns.). Tryon, May 4, 1919 (Day). Tryon, May 1918 (Millsp. no. 4161). Rich woods, Tryon, April 16, 1922 (PT. no. 1606).

64. **Triodia flava** (L.) Hitchc. (Purple Top)
Poa flava L.
P. sesleroides Michx.
Tridens flavus Hitchc.
Tricuspis flava Hubbard

Frequent on the stiff piedmont clays, in open ground, and by its height and color conspicuous. Specimens: Godshaw Hill, Nov. 1926 (PT. nos. 2361, 2363).

65. **Triticum durum** Desf. (Durum Wheat)

Along the railroad embankments, June 20, 1921 (PT. no. 649a). Introduced from Europe.

66. **Secale cereale** L. (Rye)

Introduced from Europe, along the railroad track, Tryon, May 23, 1926 (PT. no. 2261).

67. **Elymus virginicus** L. (Wild Rye. Lime Grass)

Frequent in rich woods, chiefly in or near the mountains. Specimens: Side of Tryon Mt., July 11, 1899 (Towns.). Rich woods, Tryon, June 20, 1921. Deep forests, Skuyuka Mt., July 21, 1921 (PT. nos. 651, 1035).

68. **Hordeum pusillum** Nutt. (Wild Barley)

Introduced with grass seed in lawns, a native of the Great Plains. Specimen: Godshaw Hill, May 23, 1926 (PT. no. 2211).

69. **Hordeum vulgare** L. (Cultivated Barley)

Introduced from Europe, along the railroad embankment, Tryon, June 20, 1921 (PT. no. 649).

70. **Lolium perenne** L. (Darnel)

Naturalized from Europe, and established in lawns and along roadsides. Specimen: Godshaw Hill, July 3, 1921 (PT. no. 828).

71. **Sphenopholis nitida** (Spring.) Scribn.
Eatonia nitida Nash
Eatonia Dudleyi Vasey

In glens and shady woods, frequent. Specimens: "Near Columbus" but without further data. Near Shunkawawkin Falls, White Oak Mt., June 1, 1899 (Towns.). In low rich woods below Godshaw Hill, May 23, 1926 (PT. no. 2243).

72. **Sphenopholis pallens** (Spreng.) Scribn.
Eatonia pennsylvanica Gray

Probably infrequent. Found by Townsend on Tryon Mt., June 1, 1899.

73. **Avena sativa** L. (Oats)

Introduced from Europe, and naturalized along the railroad embankment, Tryon. Specimen: June 20, 1921 (PT. no. 647).

74. **Arrhenatherum elatius** (L.) Beauv. (Oat Grass)
Avena elatior L.
Arrhenatherum avenaceus Beauv.

Open meadows and roadsides, frequent. Specimens: On the road between Tryon and Columbus, June 3, 1897 (Towns.). Meadows, Tryon, May, 1918 (Millsp. no. 4186). Open sterile soil, Godshaw Hill, May 23, 1926 (PT. no. 2242).

75. **Nothoholcus lanatus** (L.) Nash (Velvet Grass)
Holcus lanatus L.
Ginannia lanata Hubbard

This beautiful ornamental grass, introduced from Europe, is somewhat abundantly naturalized around Tryon in fields and roadsides. Specimens: Tryon, June 30, 1921 (PT. nos. 817, 818, 819).

76. **Danthonia spicata** (L.) Beauv. (Wild Oat Grass)
Avena spicata L.

Infrequent, in dry sterile rocky soil of the mountains. Specimens: Tryon Mt., June 2, 1899 (Towns.).

77. **Danthonia sericea** Nutt. (Wild Oat Grass)

Frequent in sandy or clay upland meadows. Specimens: Columbus, June 1, 1899 (Towns.). Tryon, May 18, 1911 (Day). Tryon, on the Leitner's Hill, where abundant, May 20, 1926 (PT. no. 2199).

78. **Calamagrostis canadensis** (Michx.) Beauv. (Blue-joint Grass)
Arundo canadensis Michx.
Arundo agrostoides Pursh

Infrequent except in alluvial meadows. Specimens: In a swampy meadow, Lynn, Aug. 20, 1921 (PT. no. 1297).

79. **Agrostis perennans** (Walt.) Tuckerm. (Thin Grass)
Cornucopiae perennans Walt.
Agrostis Scribneriana Nash

Low grounds, infrequent? Specimen: Columbus, 1899, without further data (Towns.).

80. **Agrostis hyemalis** (Walt.) BSP. (Hair Grass)
Cornucopiae hyemalis Walt.
Trichodium laxiflorum Michx.
Agrostis scabra Willd.

Common on the piedmont, in dry or moist, rich or sterile woods. Specimens: In dry soil, Tryon, Aug. 11, 1921, and in rich shaded soil of the hillsides beyond the trestle, on the state line, Aug. 12, 1921 (PT. nos. 1194, 1201).

81. **Agrostis Elliottiana** Schultes (Bent Grass)
Agrostis arachnoides Ell.

Frequent in dry meadows. Specimen: Tryon, May 23, 1926 (PT. no. 2248).

82. **Agrostis alba** L. (Red Top. Fiorin. White Bent Grass)

Introduced from Europe and naturalized. The only specimen is by Townsend, collected in an atypical habitat: Side of Tryon range, June 21, 1899.

83. **Agrostis capillaris** L. (Red Top)
Agrostis alba var. *vulgaris* Thurb.

Introduced from Europe, cultivated and naturalized along roadsides and in fields. Specimens: Roadside thicket, Melrose, June 27, 1921, and fields and roadsides, Tryon, June 29, 1921 (PT. nos. 714, 715, 782).

84. **Cinna arundinacea** L. (Wood Reed Grass)

Frequent in shady woods and wet meadows. Specimens: In a swampy meadow, Lynn, Aug. 20, 1921. In shady woods, "Valhalla," Aug. 29, 1921 (PT. nos. 1301, 1423).

85. **Cinna latifolia** (Trev.) Griseb. (Wood Reed Grass)

Damp mountain woods, frequent. Specimen: Rich shady woods, Pearson's Falls, Sept. 2, 1921 (PT. no. 1503).

86. **Phleum pratense** L. (Timothy)

Introduced from Europe, and abundantly naturalized in waste places, fields, etc.

87. **Muhlenbergia foliosa** Trin.

Low grounds. Specimen: Columbus, Oct. 1, 1926 (PT. no. 2373).

88. **Muhlenbergia tenuiflora** (Willd.) BSP.
Agrostis pauciflora Pursh.

Shady mountain forests, occasional. Specimen: In rich woods, Vaughan's Gap between Hogback and Rocky Spur Mts., Aug. 13, 1921 (PT. no. 1229).

89. **Sporobolus berteroanus** (Trin.) Hitchc. (Smut Grass)
Sporobolus indicus of auths., not L.

Adventive from the Tropics, and abundant as a weed in open soil. Specimens: Columbus, June 9 and July 5, 1899 (Towns.).

90. **Stipa avenacea** L. (Black Oat-Grass)
Stipa barbata Michx.
Stipa bicolor Pursh.

Common in dry thin woods in spring. Specimens: Columbus, May 9, 1899 (Towns.). Tryon, May 15, 1911 (Day). Tryon, May 1918 (Millsp. no. 4082). In dry woods, April 16, 1922 (PT. no. 1617).

91. **Aristida purpurascens** Poir. (Triple-awn Grass. Broom Sedge)

In dry fields, Tryon. Specimen: Sept. 15, 1926 (Hunnew.).

92. **Leptochloa filiformis** (Lam.) Beauv.
Eleusine mucronata Michx.
Leptochloa mucronata Kunth.

One of the biggest of our grasses, found around cultivated ground and roadsides, perhaps spreading in from the lowlands. Specimens: Columbus, Oct. 1899 (Towns.). Tryon, Aug. 11, 1921 (PT. no. 1189).

93. **Eleusine indica** Gaertn. (Goose Grass. Yard Grass)
Cynosurus indicus L.

Common weed, adventive from Tropics. Specimens: June 24, 1921 (PT.). Townsend's specimen from the side of the Tryon range, July 18, 1899, is from an atypical habitat.

94. **Dactyloctenium aegypticum** (L.) Richter. (Crowfoot Grass)
Cynosurus aegyptius L.

A weed, noted along the railroad track in summer, adventive from Tropics.

95. **Cynodon Dactylon** (L.) Pers. (Bermuda Grass)
Panicum Dactylon L.
Capriola Dactylon Ktze.

Introduced from Europe, cultivated, and also occurring as a weed, frequent.

96. **Arundo Donax** L. (Giant Reed)

Introduced from Old World and cultivated, sometimes escaping to roadsides and waste places around Tryon.

97. **Gymnopogon ambiguus** (Michx.) BSP.
Andropogon ambiguus Michx.

Infrequent, in very sterile pine woods. Specimen: Tryon, May 1911 (Day). My specimen is from just outside the limits of our area in Greenville Co., S. C., Aug. 31, 1921.

98. **Anthoxanthum aristatum** Bois. (Sweet Vernal Grass)
Anthoxanthum Pueli Lecoq & Lamotte

Introduced from Europe, and spreading by admixture with lawn seed. Specimen: In lawns, Tryon, April 21, 1922 (PT. no. 1650).

99. **Leersia oryzoides** (L.) Sw. (Rice Cut Grass)
Phalaris oryzoides L.
Homalocenchrus oryzoides Poll.

Occasional in damp woods. Specimen: Tryon, Sept. 1, 1921 (PT. no. 1437).

100. **Leersia virginica** Willd. (White Grass)
Homalocenchrus virginica Britton

Frequent in damp woods. Specimens: Columbus, Aug. 24, 1899 (Towns.). On a wet bank, Tryon, Aug. 28, 1921, and in wet woods, Pearson's Falls, Sept. 2, 1921 (PT. nos. 1409, 1444).

101. **Digitaria filiformis** (L.) Koel. (Finger Grass)
Panicum filiforme L.
Syntherisma filiforme Nash

Sandy sterile soil near Millspring. Specimen: Aug. 14, 1899 (Towns.).

102. **Digitaria sanguinalis** (L.) Scop. (Crab Grass)
Panicum sanguinale L.
Syntherisma praecox Walt.
Syntherisma sanguinalis Nash
Digitaria sanguinalis var. *marginata* (Link) Fernald

A common weed, naturalized from Europe, found in dooryards, lawns, on rubbish heaps, and even in woods. Specimens: Columbus, 1899 (Towns.). Tryon, Aug. 25, 1921 (PT. no. 1399.).

103. **Paspalum laeve** Michx.

Sandy soil, occasional. Specimen: Columbus, July 9, 1897 (Towns.). This specimen, in the National Herbarium, has been marked *P. australe* Nash, a species not recognized by Hitchcock and Chase, curators of the grass herbarium. In a dry field, Tryon, Sept. 15, 1926 (Hunnew. no. 10082).

104. **Paspalum Boscianum** Flugge.

Lowland woods. Specimen: "Huston Place" near Columbus, Aug. 7, 1897, and Aug. 14, 1899 (Towns.).

105. **Paspalum dilitatum** Poir.

As a weed in gardens, and along roadsides. Specimen: Tryon, June 29, 1921 (PT. no. 783).

106. **Paspalum longipilum** Nash.

Mountain woods. Specimen: Tryon range, June 18, 1899 (Towns.).

Paspalum setaceum Michx. is a species found just a few miles north of our area, and is to be expected within it. Specimen from Chimney Rock, in National Herbarium.

107. **Panicum dichotomiflorum** Michx.
P. geniculatum Muhl.

Occasional in low grounds, fields, etc. Specimen: Columbus, 1899 (Towns.).

108. **Panicum anceps** Michx.

In moist soil, woods or meadows, frequent. Specimens: Millspring,

Aug. 14, 1899 (Towns.). Forming stands around the edges of moist meadows, Tryon, Aug. 11, 1921, and edge of rich woods, Tryon, July 19, 1921 (PT. nos. 1186, 985).

109. **Panicum dichotomum** L.

In woods, not infrequent. There are two specimens by Townsend: one, in his private herbarium, is without date except the year 1899. The second, in the National Herbarium, is marked "Pony" (now Fox) Mt., May 18, 1897. On this sheet is written "Typical, H. & C." (Probably Hitchcock and Chase.) In another hand is written "*P.* (*anicum*) *Roanokense* Ashe."

110. **Panicum barbulatum** Michx.

Frequent in rocky woods and on hillsides. Specimens: Two collections by Townsend, one without data except "near Columbus, 1899," the other "Pony" (Fox) Mt., May 18, 1897. Tryon, May 12, 1919 (Day).

111. **Panicum microcarpon** Muhl.
P. polyanthes Schultes

Common in woods of the mountains and foothills. Specimens: Dry open hillsides, Tryon, May 1918 (Millsp. no. 4136). Rich woods, Pearson's Falls, June 27, 1921 (the pubescent form). Shady woods along a brook below Godshaw Hill, May 23, 1926, and woods of Godshaw Hill, Nov. 1926 (PT. nos. 706, 707, 2244, 2360).

112. **Panicum xalapense** HBK.

Low woods. Specimen: Low bank of Vaughan's Creek, below Godshaw Hill, May 22, 1899 (Church.).

113. **Panicum strictum** Pursh.
Panicum depauperatum Muhl.

In sterile woods. Specimens: Landrum, May 24, 1897 (Towns.). Lynn, May 1899 (Church.).

114. **Panicum villosissimum** Nash
Panicum haemocarpon Ashe.

In sterile soil of thin woods. Specimens: Townsend, without data

except the year 1899. Along roadsides through woods, Tryon, June 20, 1921 (PT. no. 643).

115. **Panicum tsugetorum** Nash.

In the thin humus under *Tsuga caroliniana*, on "The Narrows," White Oak Mt., July 21, 1921 (PT. no. 1036). Probably quite local in distribution.

116. **Panicum sphaerocarpon** Ell. var. **inflatum** (S. & S.) Hitchc.

Dry cliffs, Melrose, May 1918 (Millsp. no. 4046). Dry cliffs, Rocky Spur, Sept. 6, 1921 (PT. no. 1464).

117. **Panicum Raveneli** (Scribn. & Merr.)

In lawns, Tryon, July 25, 1921 (PT. no. 1073).

118. **Panicum umbrosum** LeConte.
P. Ashei T. G. Pearson

Frequent in dry open ground. Specimens: Tryon, May 12, 1919, (Day). Roadsides, Tryon, June 20, 1921, and on Godshaw Hill, May 6 and 23, 1926 (PT. nos. 648, 2151, 2226, 2228).

119. **Panicum commutatum** Schultes.

Common in woods and meadows. Specimens: Tryon, May 18, 1897, Tryon range, June 1, 1899, Columbus, same date (Towns.). Tryon, May 12, 1919 (Day). In rich woods, Godshaw Hill, June 29, 1921 (PT. no. 750).

120. **Panicum clandestinum** L.

Frequent in meadows and woods. Specimens: In a moist meadow at "The Shoals," Aug. 20, 1921 (PT. no. 1331). This specimen is the pubescent form with shorter, broader leaves. In rich woods, Pearson's Falls, June 27, 1921 (PT. nos. 678-680). These specimens are of the smoother form with longer, narrower leaves.

121. **Panicum Boscii** Poir.

Frequent in sandy alluvial thickets and open, upland, clay meadows.

Specimens: Tryon, May 12, 1919 (Day). Common along the sandy woods of Vaughan's Creek, June 29, 1921; in the Leitner meadows, May 20, 1926 (PT. nos. 748, 749, 2208).

122. **Panicum molle** (Vasey) Hitchc. & Chase.

On Little Warrior Mt., May 15, 1897 (Towns.).

123. **Panicum huachucae** Ashe var. **silvicola** Hitchc. & Chase

This was identified by Millspaugh as "*P. lancearium*" but as determined by Mr. H. C. Benke it is as above. Specimen: Tryon, May 1918 (Millsp. no. 4099).

124. **Echinochloa crusgalli** (L.) Beauv. (Barnyard Grass)
Panicum crusgalli L.

Common weed in manured soil, naturalized from Europe.

125. **Chaetochloa lutescens** (Wiegel) Stuntz. (Foxtail. Pigeon Grass)
Setaria glauca Beauv.
Chaetochloa glauca Scribn.
Setaria lutescens Hubbard.

Common as a weed in lawns and waste places. Specimen: Roadsides, Tryon, July 19, 1921 (PT. no. 999).

126. **Erianthus contortus** Beauv. (Woolly Beard Grass)

In moist ground, Tryon. Specimen: Dec. 23, 1918 (Day).

127. **Erianthus divaricatus** (L.) Hitchc. (Woolly Beard Grass)
Andropogon divaricatus L.
Erianthus alopecuroides Ell.

In meadows, a magnificent grass. Specimens: Around Columbus, Oct. 1899 (Towns). In an upland meadow, south of Hogback Mt., Sept. 1, 1921 (PT. no. 1436).

128. **Andropogon scoparius** Michx. (Beard Grass)
Schizachyrium scoparium Nash.

Frequent in open upland meadows with sterile soil. Specimens: Godshaw Hill, Oct. 1926 (PT. nos. 2368, 2371).

129. **Andropogon ternarius** Michx. (Beard Grass)

Frequent in sterile soil of woods and meadows of the piedmont. Specimens: Sandy woods near the Golf Links, Dec. 24, 1920; Tryon, Oct. 1926; Columbus, Nov. 1926 (PT. nos. 1554, 2369, 2372).

130. **Andropogon virginicus** L. (Beard Grass)
Andropogon dissitiflorus Michx.
Andropogon vaginatus Ell.
Cinna lateralis Walt.

In sandy woods and sterile meadows, frequent. Specimens: Sandy woods above the Golf Links, Dec. 27, 1920; Godshaw Hill, Nov. 1926, and Columbus, same date (PT. nos. 1555, 1585, 2365, 2366).

131. **Holcus halapense** L. (Johnson Grass)
Sorghum halapense Pers.

A pasture grass, introduced from Europe, and also a weed in many bottom lands and cultivated fields. Specimens: Tryon, Aug. 10, 1897 (Towns.). Godshaw Hill, Nov. 1926, and Lynn, same date (PT. nos. 2367, 2370).

Holcus Sorghum L (*Sorghum vulgare* Pers.), the sorghum of cultivation, introduced from Old World, is sometimes persistent after cultivation, or spreads slightly to the edges of fields where it has been grown.

132. **Sorghastrum nutans** (L.) Nash. (Indian Grass. Wood Grass)
Andropogon nutans L.
Andropogon avenaceum Michx.
Sorghum nutans Gray
Sorghastrum avenaceum Nash
Chrysopogon nutans Benth.

Frequent in sandy woods and sterile meadows, a brilliant and beautiful autumn grass. Specimens: Specimens were collected for me by Miss Margaret Doubleday, Oct. 1921. Sandy embankment along the railroad tracks near the Golf Links, Dec. 25, 1920 (PT. no. 1553).

Family 13. CYPERACEAE (Sedge Family)

133. **Cyperus rivularis** Kunth. (Galingale)
Cyperus flavescens var. *castaneus* Pursh.

Frequent in low mucky ground. Specimens: Columbus, 1897 (Towns.). Low grounds around Erskine's millpond, July 23, 1921 (PT. no. 1068).

134. **Cyperus flavescens** L. (Galingale)

Along the wet sandy banks of small streams, frequent. Specimens: Side of Tryon Mt., July 20, 1899 (Towns.). Along streams, "Dark Corners," Aug. 13, 1921 (PT. no. 1232).

135. **Cyperus strigosus** L. (Galingale)

Occasional in wet ground. Specimen: Spring Mt. Park, Aug. 18, 1899 (Towns.).

Var. *compositus* Britton. Occasional in low, wet meadows. Specimen: "The Shoals," Aug. 20, 1921 (PT. no. 1330).

136. **Cyperus refractus** Engelm. (Galingale)

Rare, along the courses of forest streams. Specimen: Side of the Tryon range, July 11, 1899 (Towns.).

137. **Cyperus lancastriensis** Porter. (Galingale)

Infrequent, in low, wet, shady ground. Specimen: At the foot of Lyncote Hill, June 20, 1921 (PT. no. 636).

138. **Cyperus retrofractus** (L.) Torr. (Galingale)
Scirpus retrofractus L.

Infrequent, in marshy grass-land. Specimen: In a marsh on top of the hill beyond the trestle, on the state line, Aug. 12, 1921 (PT. no. 1207). On the side of the Tryon range, July 11, 1899 (Towns.).

139. **Cyperus esculentus** L. (Galingale)

Not infrequent, in marshy ground. Specimens: Millspring, Aug. 14, 1899 (Towns.). In a marsh on the hill beyond the trestle, on the state line, Aug. 12, 1921 (PT. nos. 1187, 1188).

140. **Cyperus filiculmis** Vahl. (Galingale)
Cyperus mariscoides Ell.

Low grounds, occasional. Specimen: Spring Mt. Pk., July 11, 1899 (Towns.).

141. **Cyperus ovularis** (Michx.) Torrey (Nut-grass)
Kyllinga ovularis Michx.

Noted as a weed in lawns around Tryon, common and troublesome, appearing in late spring and continuing to bloom under lawn conditions for the whole summer. Native in woods and fields. Specimens: Spring Mt. Pk., June 19, 1897, and "Huston Place" near Columbus, July 14, 1897 (Towns.).

142. **Cyperus echinatus** (Ell.) Wood. (Galingale)
Mariscus echinatus Ell.

In damp mountain woods near stream courses. Specimens: "Skuyuka" at 2,500 ft. alt., July 21, 1921 (PT. nos. 1011–1013).

143. **Kyllinga pumila** Michx.

Frequent in low grounds. Specimen: Around Erskine's millpond, July 23, 1921 (PT. no. 1067).

144. **Eleocharis obtusa** (Willd.) Schultes. (Spike Rush)
Scirpus capitatus Walt.

Common along stream courses and in low wet meadows. Specimens: Sides of the Tryon range, (in flower) May 31, 1899 (Towns.). Along Vaughan's Creek, in sand, July 19, 1921, and in wet places, Lynn, Aug. 20, 1921 (PT. nos. 986, 1306).

145. **Fimbrystylis mucronata** (Michx.) Blake
Fimbrystylis autumnalis R. & S., not *Scirpus autumnalis* L.
Trichelostylis autumnalis Nees
Fimbrystylis geminata Kunth.

Frequent in wet soil and on dripping rocks, also along brooks. Specimens: Side of the Tryon range, June 20, 1899 (Towns.). In a grassy brook, Tryon, Aug. 25, 1921, and on dripping rocks of Vaughan's Creek, near the foot of Hogback, Sept. 6, 1921 (PT. nos. 1397, 1485).

146. **Rynchospora capitellata** (Michx.) Vahl. (Beak Rush)
Schoenus capitellatus Michx.
Rynchospora glomerata Pursh, not *Schoenus glomeratus* L.

In low wet grounds, frequent. Specimens: Tryon, July 22, 1897

(Towns.). In swampy woods, "The Shoals," Aug. 20, 1921, and along Vaughan's Creek near Tryon, (in flower) July 19, 1921 (PT. nos. 1332, 988).

147. **Scirpus debilis** Pursh (Clubrush)

Frequent in low wet meadows. Specimens: Columbus, Aug. 1, 1899 (Towns.). In very wet ground, Lynn. Aug. 20, 1921 (PT. no. 1309).

148. **Scirpus georgianus** Harper (Bulrush)

Occasional in low shady grounds. Specimen: At the foot of Lyncote Hill, June 20, 1921 (PT. no. 637).

149. **Scirpus lineatus** Michx. (Bulrush)

Occasional in swampy ground. Specimen: In a grassy marshy spot on the hills beyond the trestle, on the state line, Aug. 11, 1921 (PT. no. 1185).

150. **Scirpus silvaticus** L. (Bulrush)

Along the sandy margins of little streams, in dense shade. Specimen: Pearson's Falls, June 27, 1921 (PT. no. 681).

151. **Scirpus polyphyllus** Vahl. (Bulrush)

Infrequent, in swampy ground. Specimen: Columbus, June 20, 1899 (Towns.).

151A. **Scirpus Eriophorum** Michx. (Wool-grass)

Probably frequent in the eastern part of the county. Specimen: Columbus, Aug. 1, 1899 (Towns.).

152. **Scleria triglomerata** Michx. (Whip-grass. Nut Rush)

Common in dry woods of the piedmont. Specimens: Tryon, July 3, 1897 (Towns.). Dry woods, Columbus, July 28, 1921 (PT. nos. 1085–1087).

153. **Carex normalis** Mackenzie (Sedge)
C. mirabilis Dewey

Frequent in lawns as a weed; undoubtedly present as a native but well adapted to lawn conditions. Specimen: On Godshaw Hill, May 1, 1926 (PT. no. 2118).

154. **Carex rosea** Schkuhr. var. **radiata** Dewey (Sedge)

Frequent in woods. Specimens: Side of Tryon range, near the lower Shunkawawkin Falls, May 22, 1897, and summit of Tryon Pk., June 27, 1899 (Towns.). Tryon, May 1918 (Millsp. no. 4098).

155. **Carex Muhlenbergii** Schkuhr. var. **enervis** Boot. (Sedge)

In woods, frequent. Specimens: White Oak Mt., May 16, 1897 (Bilt. Herb. no. 5756). Townsend's specimen from the Tryon range, June 1, 1899, is closer to this species than to any other.

156. **Carex cephalophora** Muhl. (Sedge)

Frequent in muddy ground. Specimens: Columbus, 1897 (Towns.). Wet thickets, Tryon, Aug. 17, 1921, and muddy ground, Tryon, April 19, 1922 (PT. no. 1288, 1658).

157. **Carex sterilis** Willd. (Sedge)
C. stellulata of auths. not Good.

In shady ground, beside brooks. Specimen: Tryon, May 23, 1926 (PT. no. 2246).

158. **Carex atlantica** Bailey (Sedge)
Carex stellulata var. *conferta* Chapm.
Carex sterilis of auths., not Willd.

In moist woods. Specimen: Spring Mt. Pk., June 1, 1899 (Towns.).

159. **Carex scirpoides** Schkuhr. (Sedge)

Occasional in marshy ground. Specimen: In a marsh on the hills beyond the trestle, on the state line, May 11, 1926 (PT. no. 2179).

160. **Carex laevivaginata** (Kuh) Mackenzie. (Sedge)

Occasional in muddy ground. Specimen: Growing with *C. cephalophora*, Tryon, April 19, 1922 (PT. no. 1656).

161. **Carex vulpinoidea** Michx. (Sedge)

Frequent in low moist ground. Specimens: "Huston Farm" near Columbus, June 4, 1899 (Towns.). Tryon, May 1918 (Millsp. no. 4129). Foot of Lyncote Hill, June 20, 1921 (PT. no. 638).

162. **Carex torta** Boot.

In moist woods and along brooks. Specimen: Vaughan's Creek, Tryon, April 6, 1911 (Day).

163. **Carex leptalea** Wahlenb. (Sedge)
C. polytrichoides Muhl.
C. microstachya Michx.

In moist woods, infrequent. Specimen: Tryon range, May 31 1899 (Towns.).

164. **Carex Harperi** Fernald (Sedge)

Frequent in moist woods. Specimens: Tryon, May 18, 1919 (Day). Pearson's Falls, May 11, 1926 (PT. no. 2166).

165. **Carex crinita** Lam. (Sedge)

Here probably belongs a specimen of Townsend's from the side of Tryon Mt., June 21, 1899. The specimen differs from the typical in having a somewhat 2-edged and winged stem and leaves smooth on the margins.

166. **Carex caroliniana** Schwein. (Sedge)
C. triceps Michx. var. *Smithii* Porter
C. costellata Britton

Damp mountain woods. Specimen: Side of Tryon range, June 21, 1899 (Towns.).

167. **Carex virescens** Muhl. (Sedge)
C. costellata Britton
C. costata Dewey

Common in woods and meadows. Specimens: Side of Tryon range, June 15, 1899 (Towns.). Tryon, May 1899 (Church.). Rich woods, Pearson's Falls, June 24, 1921, and in an open meadow, Tryon, May 20, 1926 (PT. nos. 656, 2207).

168. **Carex aestivalis** M. A. Curtis. (Sedge)

This interesting little sedge is somewhat infrequent over the country as a whole, but in our area is rather a characteristic species of mountain cliffs. Specimens: Tryon range, June 22, 1897, and at "Sunset Rock," White Oak Mt., June 26, 1897 (Towns.). On dripping rocks, Hogback Mt., Aug. 14, 1921 (PT. no.1255).

169. **Carex prasina** Wahlenb. (Sedge)

Occasional in wet mountain woods. Specimen: Tryon Mt., April 26, 1911 (Day).

170. **Carex communis** Bailey. (Sedge)
C. pedicellata Britton
C. pilulifera Fernald, not L.

Rare, in dry open woods. Specimen: "Hemlock Shoals," near Columbus, May 5, 1897 (Towns.).

171. **Carex pennsylvanica** Lam. (Sedge)

Frequent in moist or dry mountain woods, conspicuous only in early spring, when in flower. Specimens: Side of Tryon Mt., April 17,1899 (Towns.). Dry soil, Melrose, April 10, 1923, and moist soil, Pearson's Falls, May 17, 1926 (PT. nos. 1805, 2123). All these specimens at least partly in flower.

172. **Carex lucorum** Willd. (Sedge)
Carex pennsylvanica var. *lucorum* Fernald.

In rich woods, having the habitats of the preceding, with which it grows. Specimen: Pearson's Falls, (in flower) April 10, 1923 (PT. no. 1810).

173. **Carex Meadii** Dewey (Sedge)
C. tetanica Schkuhr. var. *Meadii* Bailey
C. tetanica var. *Canbyi* Porter
The only specimen is Townsend's, from Columbus, June 17, 1899.

174. **Carex laxiculmis** Schwein. (Sedge)

In rich woods, Melrose Mt., April 17, 1911 (Day).

175. **Carex austro-caroliniana** Bailey (Sedge)
Carex caroliniana Buckley

Mountain woods. Specimen: Side of Tryon Mt. June 10, 1899 (Towns.).

176. **Carex laxiflora** Lam. (Sedge)

Common in woods. Specimens: Piney Mt. May 27, 1899 (Towns.). Tryon, May 1899 (Church.). Tryon, May 3, 1911 (Day). Vaughan's Creek, May 1922, and Pearson's Falls, May 11, 1926 (PT. nos. 1693, 2167).

177. **Carex striatula** Michx. (Sedge)
Carex laxiflora Lam. var. *Michauxii* Bailey

In rich woods. Specimen: Vaughan's Creek, near Tryon, May 3, 1926 (PT. no. 2126).

178. **Carex leptonervia** Fernald (Sedge)
Carex laxiflora var. *leptonervia* Fernald

In rich woods. Specimen: Pearson's Falls, May 11, 1926 (PT. no. 2169).

179. **Carex blanda** Dewey (Sedge)
Carex laxiflora var. *blanda* Boot.

In springy places and moist woods. Specimen: Vaughan's Creek, near Tryon, April 1922 (PT. no. 1624).

180. **Carex anceps** Willd. (Sedge)
Carex laxiflora var. *patulifolia* (Dewey) Carey

Frequent in moist woods. Specimens: Tryon range, June 1, 1899 (Towns.). Brook below Godshaw Hill, May 23, 1926 (PT. no. 2245).

181. **Carex plantaginea** Lam. (Sedge)

This very handsome species is frequent in rich soil in cool mountain glens of the Canadian Hemlock zone. Specimens: Tryon, (in flower) April 20, (in fruit) May 10, 1897 (Bilt. Herb. no. 1805). Pearson's Falls, (sterile) Dec. 28, 1921, and on dripping rocks, same locality, (in flower) April 20, 1922 (PT. nos. 1568, 1681).

182. **Carex grisea** Wahlenb. (Sedge)

A single specimen: Side of Tryon range, May 25, 1899 (Towns.).

183. **Carex debilis** Michx. (Sedge)

In marshy ground. Specimen: In a marsh on the hill beyond the trestle, on the state line, May 11, 1926 (PT. no. 2180).

Var. *Rudgei* Bailey. In wet woods. Specimens: Along Vaughan's Creek, near Tryon, June 29, 1921 (PT. nos. 743–745).

Var. *interjecta* Bailey. In woods. Specimens: Columbus, "Jan." (June?) 17, 1899 (Towns.)

184. **Carex scabrata** Schwein. (Sedge)

Frequent in marshy ground and along streams, often in considerable colonies. Specimens: Near Shunkawawkin Falls on White Oak Mt., June 19, 1899 (Towns.). Marshy ground half way up Vaughan's Gap. between Hogback and Rocky Spur, Aug. 14, 1921 (PT. nos. 1221, 1222).

185. **Carex lurida** Wahlenb. (Sedge)
Carex tentacula Muhl.

Common in low grounds. Specimens: Tryon, May 23, 1897 (Towns.) Tryon, May 1918 (Millsp. no. 4128). Mucky ground below Lyncote Hill, June 20, 1921, and in a marsh on the hill beyond the trestle, on the state line, May 11, 1926 (PT. nos. 639, 640, 2348).

186. **Carex intumescens** Rudge. (Sedge)

Frequent in low marshy ground. Specimens: In wet woods at "The Shoals," Aug. 20, 1921, and in a marsh on the hill beyond the trestle, on the state line, May 11, 1926 (PT. nos. 1315, 2178).

Family 14. ARACEAE (Arum Family)

187. **Orontium aquaticum** L. (Golden Club)

This handsome plant has been reported, blooming in April, from Landrum, by Miss Wright. Though there are no specimens, the plant is unmistakable and the report so probably correct that it is here included in the flora. It is a plant of the lowlands and is to be sought for elsewhere in our area at low altitudes.

188. **Arisaema triphyllum** (L.) Schott. (Jack-in-pulpit)
Arum triphyllum L.

Common in cool woods and on dripping rocks, in shade. Specimens: Melrose, May 1918 (Millsp. no. 4196.). In rich woods, "Valhalla," (in fruit) Aug. 25, 1921, and at Pearson's Falls, May 17, 1926 (PT. nos. 1392, 2189).

189. **Arisaema pusillum** (Peck) Nash. (Dwarf Jack-in-pulpit)

Occasional in cool mountain woods. Specimens: In woods, Pearson's Falls, and on dripping rocks, same locality, May 11, 1926 (PT. nos. 2157, 2190)

Family 15. COMMELINACEAE (Wandering-Jew Family)

190. **Commelina hirtella** Vahl (Day-flower)
Commelina longifolia Michx.

Frequent in sandy alluvial soils on the piedmont. Specimens: Along the Green River, (flower) June 2, 1899, and (fruit) Aug. 18, 1897 (Towns.). Shady roadside, Tryon, May 28, 1919 (PT. no. 0248).

191. **Commelina communis** L. (Day-flower)

Little weed, naturalized from Tropics, according to most authorities, but appearing as if native in many localities here. Specimens: Roadsides, Godshaw Hill (as if introduced), June 29, 1923; in cool mountain forests (as if native), Pearson's Falls, Sept. 12, 1921 (PT. nos. 767, 1500–1502).

192. **Tradescantia virginiana** L. (Spiderwort. Spiderlily)

Common in woods, thickets, and open ground where the soil is rich and moist. Specimens: Tryon, May 1899 (Church.). Moist open ground, Saluda, May 1918 (Millsp. no. 4153).

193. **Tradescantia pilosa** Lehmn.

Frequent in woods, thickets, and open ground. Specimens: Side of Tryon range, May 22, 1897 (Towns.). Tryon, May 1899 (Church.). This specimen was found among the undetermined plants in the Gray Herbarium and seems to belong here, or more nearly here than elsewhere. Tryon, June 2, 1919 (PT. no. 0265).

194. **Tradescantia montana** Shuttlw. (Spiderwort. Spiderlily).

Frequent on mountain sides and cliffs, under shade. A handsome species. Specimens: Side of the Tryon range, June 15, 1899 (Towns.). In rich woods, Pearson's Falls, June 27, 1921, and on dry cliffs, Rocky Spur, Sept. 6, 1921 (PT. nos. 703, 1465). On Rocky Spur and Hogback, May 27, 1927 (Wherry).

Family 16. JUNCACEAE (Rush Family)

195. **Juncus effusus** L. var. **solutus** Fernald & Wiegand (Bog or Soft Rush).

Common in low meadows, marshy ground, on the piedmont, and not uncommon by spring-heads and along watercourses in the mountains. Specimens: Tryon range, May 31, 1899 (Towns.). On a rock, Pearson's Falls, Dec. 28, 1920, and in a marsh on the hills beyond the trestle, on the state line, May 11, 1926 (PT. nos. 1564, 2172).

196. **Juncus tenuis** Willd. (Yard Rush. Wire Rush)
J. bicornis Michx.

Abundant in most of our habitats. Specimens: Summit of Tryon Pk., June 27, 1899 (Towns.). In wet woods, Pearson's Falls, (flowers) June 27, and (fruit) Sept. 3, 1921; lawns, Godshaw Hill, May 11, 1926 (PT. nos. 705, 1443, 2183)

Var. *anthelatus* Wiegand. In low grounds at the foot of Lyncote Hill, June 20, 1921 (PT. no. 634).

197. **Juncus debilis** Gray. (Rush)

In moist ground. Specimen: In a marsh on the hill beyond the trestle, on the state line, Aug. 12, 1921 (PT. no. 1202)

198. **Juncus marginatus** Rostk. (Rush)

Common in dry or moist soil. Specimens: "Huston Farm" near Columbus, June 4, 1898 (Towns.). On rocks at Pearson's Falls, Dec. 28, 1920; in dry soil near Columbus, Aug. 20, 1921, and in shaded woods below Godshaw Hill, July 19, 1921 (PT. nos. 1566, 1319, 984).

199. **Juncus setaceus** Rostk. (Rush)

In moist woods. Specimens: Along Vaughan's Creek, below Godshaw Hill, June 29, 1921 (PT. nos. 746, 747).

200. **Juncus paradoxus** E. Meyer (Rush)
Juncus acuminatus Michx.
Juncus sylvaticus Muhl.

In marshy ground, frequent. Specimen: Tryon, May 1899 (Church.). Tryon, Aug. 23, 1921 (PT. no. 1352).

201. **Luzula campestris** (L.) DC. var. **bulbosa** A. Wood (Wood Rush)
Juncoides campestre (L.) Ktze. var *bulbosum* (Wood) Coville & Baker
Juncoides bulbosa Small

Common in woods. Specimen: Banks of Vaughan's Creek, Tryon, April 14, 1919 (Day).

202. **Luzula intermedia** (Thuill.) Nelson (Wood Rush)
Juncoides intermedia Rydb.
Juncoides campestris (L.) Ktze. var. *multiflora* Sheldon.
Luzula campestris (L.) DC. var. *multiflora* (Ehrh.) Celak.

Frequent in woods and meadows. Specimens: Sides of Tryon Mt., Aug. 17, 1899 (Towns.). Wet meadow on the road to Landrum, near the state line, May 5, 1926 (PT. no. 2135).

Var. *echinata* (Small) House
Juncoides echinatum Small
Juncoides campestre var. *echinatum* Coville & Blake
Luzula multiflora var. *echinata* Fernald & Wiegand

A single specimen: Tryon range, May 21, 1899 (Towns.).

203. **Luzula carolinae** Wats. (Wood Rush)
Juncoides carolinae Ktze.
Luzula pilosa Muhl.
Luzula vernalis Wats. & Coult.
Juncoides pilosum Coville
Luzula saltuensis Fernald
Juncoides altuensis Heller

In rich soil of mountain woods. Specimen: Pearson's Falls, March 1928 (Kimber).

Family 17. LILIACEAE (Lily Family)

204. **Chamaelirium luteum** (L.) Gray. (Devil's Bit. Blazing Star)
Veratrum luteum L.
Helionas dioica Pursh
Siraitos aquaticus Raf.

This handsome plant, which has the fetid odor of chestnut blossoms, is common in rich woods, especially of the foothills. Specimens: Spring Mt. Pk., May 24, 1897 (Towns.). Tryon, May 10, 1911 (Day). Tryon, May 1918 (Millsp. no. 4039.). Rocky woods, Pearson's Falls, June 27, 1921; mountain woods, Howard's Gap, (in fruit) Aug. 30, 1921; rich woods, "Valhalla" April 20, 1922 (PT. nos. 684, 1429, 1623, 1632).

205. **Amianthium muscaetoxicum** (Walt.) Gray. (Fly Poison)
Melanthium muscaetoxicum Gray
Chrosperma muscaetoxica Kuntze

This curious and handsome plant, which is deadly poisonous, has been found in this county but once, and that in the extreme easternmost part, at Poor's Ford, on the Green River. This spot has the lowest altitude in the county, and the occurrence of this species there is unusual, as it is abundant on the mountain meadows of the Black Mountain range, which includes Mt. Mitchell. Specimen: Poor's Ford, May 1900 (Towns.).

206. **Melanthium latifolium** Desr. (Bunch Flower)

Of this strange and handsome plant a single specimen has been taken in the county, by Townsend in 1897 (in May?). The collector states: "Found coming down the glen from Captain Pearson's house"—which must mean in the Pacolet gorge near Melrose.

207. **Stenanthium gramineum** (Ker.) Kunth.
Veratrum angustifolium Pursh

This curious species is rather infrequent, in woods of the foothills. Specimens: Spring Mt. Pk., Aug. 14, 1897 (Towns.). Dry woods on the hills beyond the trestle, on the state line, Aug. 11, 1921 (PT. nos. 1181–1183).

208. **Uvularia perfoliata** L. (Corn Lily. Bellwort.)

Common throughout in rich woods. Specimens: Along Skuyuka Creek, April 1897 (Towns.). Tryon, April 20, 1922, and April 10, 1923 (PT. nos. 1657, 1890).

209. **Uvularia sessilifolia** L. (Corn Lily. Bellwort.)
Oakesia sessilifolia S. Wats.
Oakesiella sessilifolia Small

Common throughout in woods. Specimens: April 15, 1911 (Day). On the hills beyond the trestle, on the state line, April 20, 1923 (PT. no. 1870).

210. **Allium cernuum** Roth. (Wild Onion)

Probably infrequent or rare. It was reported to me by Woolson, without specimens. Townsend has a specimen from Chimney Rock, Aug. 18, 1897. Thus there is no Polk County specimen, but it is undoubtedly present in rich mountain woods.

211. **Allium vineale** L. (Onion Grass. Wild Garlic)

This noxious lawn and pasture weed, naturalized from Europe, is too common. It rarely flowers, producing bulblets in place of flowers in our area. Specimen: Cultivated ground, Tryon, June 20, 1921 (PT. no. 614).

212. **Hemerocallis fulva** L. (Tawny Day Lily)

Introduced from Europe and cultivated, frequently escaping.

213. **Lilium superbum** L. (Turk's Cap Lily)

This handsome species is quite common in the richer soils, in woods and meadows, particularly in the mountains. Specimens: Fox Mt., Aug. 3, 1897 (Towns.). White Oak Mt., at 3000 ft., July 21, 1921; in a rich glen, Melrose, Aug. 8, 1921 (PT. nos. 1082, 1110).

214. **Lilium carolinianum** Michx. (Carolina Lily)
Lilium superbum L. var. *carolinianum* Chapm.

Fairly frequent in woods and meadows, rather more a plant of the foothills than the preceding species. Specimens: Columbus, 1897 (Towns.). Columbus, July 28, 1921 (PT. no. 1081).

These two species of lily are probably not the only ones found in our area, and various persons have reported lilies that were "different," in conversations with me. Henderson County, on the west, has also *Lilium Grayi* and *Lilium canadense*, and these may at some future date be demonstrated within our borders.

215. **Erythronium americanum** Ker. (Trout Lily. Yellow Adder's Tongue)
Erythronium angustatum Raf.
Erythronium Dens-canis Michx.
Erythronium lanceolatum Pursh

This species, which often bears the misnomer of dog-tooth's violet, is common in rich shaded soils throughout. Specimens: Spring Mt. Pk., April 23, 1897 (Towns.). Vaughan's Creek banks, March 4, 1911 (Day). Tryon, April 10, 1923 (PT. no. 1833).

216. **Ornithogalum umbellatum** L. (Star of Bethlehem)

Introduced from Europe, escaped from cultivation, and naturalized in meadows. Specimens: Tryon, April 22, 1922, and May 5, 1926 (PT. nos. 1699, 2140).

217. **Muscari racemosum** (L.) Mill. (Grape Hyacinth)
Hyacinthus racemosus L.

Introduced from Europe, escaped from cultivation, and naturalized in a number of places. Specimens: In a meadow, with *Ornithogalum umbellatum*, on the Landrum road, March 21, 1919 (Day). In a meadow near "The Mimosa," April 28, 1926 (PT. no. 2115).

218. **Muscari botryoides** (L.) Mill. (Grape Hyacinth)
Hyacinthus botryoides L.

Introduced from Europe, and escaped from cultivation. Specimen: Columbus, 1899 (Towns.).

219. **Yucca flaccida** Haw. (Bear Grass. Adam's Needle)
Yucca puberula & *Yucca glaucescens* Haw.
Yucca filamentosa of Gattinger's Tennessee Flora, not of L.

Though seedlings and basal rosettes of the local yucca are rather common in stony or gravelly open soil of the mountains and foothills,

this plant very rarely comes into bloom. At irregular times or intervals it may suddenly make what is said to be a resplendent showing. Cultivated specimens of the same species in our area bloom regularly. The only flowering specimens are two by Townsend, collected in 1899, which must have been one of the heavily blooming years. One specimen, from the foot of Tryon Mt., consists only in a leaf and one flower, collected in June; the other consists in an inflorescence heavily laden, taken on July 1. Neither of these can be identified with satisfactory exactness, but Trelease in his monograph of the genus gives this as the only species from our region, *Yucca filamentosa* occurring in North Carolina in the west-central part of the state.

220. **Smilacina racemosa** (L.) Desf. (False Solomon's-Seal)
Convallaria racemosa L.
Vagnera racemosa Morong.

Common in mountain woods and cool glens of the foothills. Specimens: Pearson's Falls, May 11, 1926. The following specimens in fruit on dates collected: Glen Walden, June 29, 1921; Villa Barbara Hill, June 20, 1921 (PT. nos. 755, 759, 758, 631).

221. **Disporum lanuginosum** (Michx.) Nichols.
Streptopus lanuginosus Michx.

Occasional in rich mountain woods or foothill glens. Specimens: Foot of Warrior Mt., April 26, 1919; in Vaughan's Gap, (in fruit) Aug. 14, 1921 (PT. nos. 0154, 1243). Pearson's Falls, May 1, 1928 (Kimber).

222. **Clintonia borealis** (Ait.) Raf. (Dogberry)
Clintonia nutans Raf.

Fairly frequent in mountain woods. Specimen: Summit of Hogback Mt., (in fruit) Sept. 18, 1927 (Wherry). Blooms in May and June.

223. **Clintonia umbellulata** (Michx.) Torr. (Dogberry)
Dracaena umbellulata Michx.
Clintonia ciliata Raf.

This Alleghenian endemic species is a little commoner than the preceding. Specimens: Summit of Hogback Mt., (in fruit) Sept. 18, 1927. A specimen in flower, May 1925, was sent me by Mrs. Gertrude Ludlom from the summit of White Oak Mt.

224. **Asparagus officinalis** L. (Asparagus)

Common in waste ground, introduced from Europe, cultivated and escaped. Specimen: Tryon, May 1918 (Millsp. no. 4141).

225. **Polygonatum biflorum** (Walt.) Ell. (Solomon's Seal)
Convallaria biflora Walt.
Polygonatum angustifolium Pursh
Solomonia biflora Farwell

Infrequent, in cool woods. Specimen: Tryon, April 16, 1919 (PT. no. 0124).

226. **Polygonatum commutatum** (R. & S.) Dietr. (Solomon's Seal)
Solomonia commutata Britton

Frequent in rich soil in mountain and foothill forests. Specimens: Warrior Mt., May 1918 (Millsp. no. 4064). Rich woods, White Oak Mt., near the summit, July 21, 1921 (PT. no. 1002).

227. **Medeola virginiana** L. (Indian Cucumber-root)

Common in rich soil of mountain and foothill woods. Specimens: Spring Mt. Pk., June 26, 1899 (Towns.). Rich woods, Vaughan's Gap, (in fruit) Aug. 14, 1921 (PT. no. 1242).

228. **Trillium sessile** L. (Wake Robin. Red Trillium)
Solanum triphyllon Catesby
Trillium longiflorum Raf.

This little species, common in the central part of the state, is not nearly so frequent here as the following. It is found in rich piedmont woods, or less frequently, in the mountains. Specimens: Tryon, April 1, 1897 (Towns., as to right-hand specimen on the sheet.) Melrose Mt., April 17, 1911 (Day). Tryon, April 20, 1897 (Bilt. Herb.). April 18, 1928 (Kimber).

229. **Trillium Hugeri** Small . (Wake Robin. Red Trillium).

This is the common red, sessile-flowered Trillium of the region, though it was formerly generally called *T. sessile*, a species rarer in this region. Frequent in rich woods of the mountains and foothills. Specimens: Moist rocky woodlands, Tryon, April 27th, 1904 (Bilt. Herb. nos.

14931, 14931A). Tryon, April 20, 1897 (Bilt. Herb. no. 4235). Skuyuka Creek banks, April 23, 1897, and side of Tryon range, April 1, 1897 (Towns.). Pearson's Falls, April 18, 1919 (Day). "Valhalla," April 19, 1922; Melrose, April 20, 1922 (with stamens petaloid); Pearson's Falls, May 17, 1926 (PT. nos. 1641, 1674, 2192.). South ridge of Hogback Mt., May 27, 1927 (Wherry). Pacolet Gorge, April 26, 1926 (Kimber).

230. **Trillium erectum** L. var. **album** (Michx.) Pursh. (White Trillium).
Trillium rhomboideum var. *album* Michx.
Trillium nutans Raf. var. *bicolor* Raf.
Trillium Rugelii Rendle
Trillium album Small

The white variety of *Trillium erectum* seems to be the only phase of this complex species so far discovered in our area, the ill-smelling red-flowered species being quite absent. This variety grows in rich mountain and foothill woods, in company with *T. grandiflorum* var. *parvum* and *T. simile*, and is often mistaken for them. It is not so plentiful as they. Specimens: On dripping rocks, Pearson's Falls, April 20, 1922 (PT. no. 1685).

231. **Trillium grandiflorum** (Michx.) Schott. var. **parvum** Gates. (White Trillium).

This curious little variety of the well known species seems to be the only phase present in our area. There is no authenticated specimen of true *T. grandiflorum*, the following species being the common one that is ordinarily mistaken for it, whilst this variety, though common, often passes unnoticed. Specimens: Hogback Mt., April 28, 1899 (Towns.). Melrose, April 10, 1923 (PT. no. 1830).

232. **Trillium simile** Gleason (White Trillium).

This splendid big species, with beautiful creamy petals and dark ovary at its center, is a rare plant, territorially considered, growing only in Buncombe and Polk Counties, N. C., and Fannin Co., Ga., so far as is definitely known, though it is undoubtedly present in Henderson Co., N. C., Greenville Co., S. C., etc. In our area it is usually called *T. grandiflorum*, which it much resembles. Specimens: Melrose, April 29, 1897 (Towns.). Tryon, April 26, 1911 (Day). Melrose Mt., north slope in rich forest, April 10, 1923 (PT. no. 1831). Tryon and Pearson's Falls, April 18, 1928 (Kimber).

233. **Trillium Catesbaei** Nutt. (Nodding Trillium).
T. cernuum L., in par.
T. stylosum Nutt.
T. nervosum Ell.

Common in mountain and piedmont woods. The last of the Trilliums to bloom. Specimens: Along Skuyuka Creek, April 21, 1897 (Towns.). Skuyuka, May 1899 (Church.). Tryon, May 5, 1897 (Bilt. Herb. no. 128d). Tryon, April 25, 1919 (Day). Tryon, April 16, 1922 (PT. no. 1608).

234. **Aletris farinosa** L. (Colic Root. Star Grass).
Aletris alba Michx.

Common in clay meadows. Specimens: Piney Mt., June 2, 1897 (Towns.). Grassy meadow, Leitner's Hill, June 29, 1921 (PT. nos. 751–753).

235. **Smilax ecirrhata** (Engelm.) Wats.

Common in mountain and piedmont woods. Specimens: Tryon Range, April 17, 1899 (Towns.). Tryon, April 28, 1911, May 1, 1919 (Day). Godshaw Hill, May 1, 1926 (PT. no. 2123).

236. **Smilax herbacea** L. (Carrion Flower).
Nemexia herbacea Small
Nemexia caerulea & *N. nigra* Raf.

Common in woods and meadows, especially the piedmont. Specimens: Leitner meadow, May 20, 1926, and woods, Tryon, (in fruit) Aug. 11, 1921 (PT. nos. 2205, 1173).

237. **Smilax Hugeri** (Beck) Norton.
Nemexia Hugeri Small

Common, in moist woods of the piedmont. Specimens: Woods, "Valhalla," July 23, 1921, and Tryon, (in fruit) Aug. 24, 1921 (PT. nos. 1047, 1372).

238. **Smilax rotundifolia** L. (Green Brier. Horse Brier).

Common, in woods throughout. Specimen: Little Warrior Mt., May 15, 1897 (Towns.).

239. **Smilax glauca** Walt. (Catbrier).

Abundant in woods, meadows, fields, and waste places. Specimens: Tryon Mt., May 31, 1899 (Towns.). Tryon, May 1899 (Church.). Tryon, May 17, 1919 (Day). Open pine woodlands, general, May 1918 (Millsp. no. 4108). Along the railroad track, May 23, 1926, and thickets, Tryon, same date (PT. nos. 2262, 2249).

240. **Smilax Bona-Nox** L. (Greenbrier. Catbrier).

In woods on the piedmont, rare. Specimen: May 2, 1919 (PT. no. 0194).

241. **Smilax pseudo-china** L. (Greenbrier).

Thickets, Tryon, May 1899 (Church.). The only specimen.

242. **Smilax laurifolia** L. (Evergreen Catbrier).

This occurs in Miss Wright's list as from Tryon. This summer-blooming species is generally considered a pine-barren plant, and might well be set down to error on Miss Wright's part, but as it occurs in Henderson County, (specimen in Gray Herb.) adjoining on the west, it may, with some reservation, be admitted to the flora. Miss Wright has put on record also *Smilax Walteri* Pursh, also a pine-barren species, and from Log Cabin Inn *Smilax tamnifolia* Michx., but in the absence of specimens, and without their record in adjoining regions, they cannot be admitted.

Family 18. DIOSCOREACEAE (Wild Yam Family)

243. **Dioscorea glauca** Muhl. (Wild Yam).

This southern species is common in dry or moist woods throughout. The rootstocks are medicinal and poisonous; the seed pods are highly ornamental. Specimens: Summit of Tryon Pk., April 29, 1897 (Towns.). On a shaded bank along the highway, Melrose, June 24, 1921 (PT. nos. 654–655A). The following specimens in fruit: summit of White Oak Mt., July 21, 1921; dry woods, Tryon, Aug. 11, 1921; damp woods, "Dark Corners," Aug. 13, 1921 (PT. nos. 1001, 1174, 1238).

244. **Dioscorea paniculata** Michx. (Wild Yam).
Dioscorea villosa of auths., but not certainly of L.

This more northern species is infrequent in our area. Specimens: Tryon, May 1918 (Millsp. nos. 4131, 4164, 4165).

Family 19. AMARYLLIDACEAE (Amaryllis Family)

245. **Hypoxis hirsuta** (L.) Coville var. **leptocarpa** (Engelm. & Gray) Brackett (Yellow Star Grass. Yellow Grass Flower).

Common in dry soils, woods and meadows. Specimens: Little Warrior Mt., April 14, 1897 (Towns.). Tryon, May 1918 (Millsp. no. 4035). Tryon, July 19 and Aug. 17, 1921, and summit of White Oak Mt., July 25, 1921 (PT. nos. 993–995, 1043, 1077, 1290).

Family 20. IRIDACEAE (Iris Family)

246. **Sisyrinchium graminoides** Bicknell (Blue-eyed Grass)
Sisyrinchium anceps Wats.
Sisyrinchium gramineum Curtis, not Lam.

Very common in meadows and light woods. Specimens: Tryon, April 30, 1911 (Day). Tryon, May 1918 (Millsp. no. 4074). Along a shady brook, Tryon, May 6, 1926; rich shady hillside, Tryon, May 11, 1926; dry open woods, Tryon, May 20, 1926 (PT. nos. 2146, 2173, 2197).

247. **Sisyrinchium atlanticum** Bicknell (Blue-eyed Grass).
Sisyrinchium apiculatum Bicknell

Not infrequent, in meadows. Specimens: Tryon, May 3, 1911 (Day). On the Rutherfordton road, six miles northeast of Millspring, May 26, 1927 (Wherry).

248. **Sisyrinchium carolinianum** Bicknell (Blue-eyed Grass)
S. fibrosum Bicknell

Occasional, in wet woods. Specimen: Tryon, (fruit) Aug. 12, 1921 (PT. no. 1204). "Huston Place," Columbus, May 8, 1897, and Tryon Mt., June 19, 1897 (Towns.).

249. **Sisyrinchium dichotomum** Bicknell (White Grass-flower).

This odd little species was originally described as occurring only in woods of Rutherford County. It is rather frequent in mountain and foothill woods in summer in our area. Specimens: In rich woods, Skuyuka Mt., July 21, 1921, and in dry woods, Valhalla, July 23, 1921 (PT. nos. 1044, 1045, 1069).

250. **Belamcanda chinensis** (L.) DC. (Blackberry Lily)
Ixia chinensis L.
Gemmingia chinensis Ktze.

This handsome oriental species is grown in gardens and is quite extensively naturalized in our area. Specimens: Along the roadside, Tryon Mt., June 30, 1921 (PT. nos. 802, 803).

251. **Iris cristata** Ait. (Crested Iris)

This beautiful little species, of the interesting subgenus *Evansia*, is abundant in woods of the mountain and foothill regions, chiefly in the Porter soils. Specimens: Along Skuyuka Creek, Tryon Mt., April 14, 1897 (Towns.). Tryon, April 12, 1911 (Day). Tryon, April 16, 1922 (PT. no. 1612).

252. **Iris verna** L. (Dwarf Iris)

Common throughout our area, both in Porter and Cecil soil series. Specimens: Tryon, March 31, 1911 (Day). Mountain woods, April 20, 1922 (PT. no. 1688). On the Rutherfordton road, 6 miles northeast of Millspring, May 26, 1927 (Wherry, the collector, says of this specimen that it is "apparently the coastal plain form." Only leaves are present in this and the following specimen, of which he says "Mountain form"). Summit of Hogback Mt., May 27, 1927 (Wherry).

253. **Iris versicolor** L. (Blue Flag. Fleur-de-lis)
I. virginica Pursh

Infrequent, in marshy ground on the piedmont, or by streams in mountain forests. Specimens: Tryon, May 1899 (Church.). Mountainsides, May 1918 (Millsp. no. 4198). Side of Tryon Mt., May 25, 1897 (Towns.).

Family 21. ORCHIDACEAE (Orchid Family)

254. **Cypripedium parviflorum** Salisb. (Yellow Lady's Slipper)
Cypripedium pubescens Sw.
Cypripedium flavescens DC.
Cypripedium parviflorum var. *pubescens* (Willd.) Knight
Cypripedium bulbosum Mill.
Cypripedium Calceolus Walt.
Cypripedium hirsutum Mill.

In cool mountain woods, not infrequent. In our area this beautiful little orchid merges imperceptibly into the so-called var. *pubescens* (Willd.) Knight. Though in many regions students affirm that they can be maintained as two separate species, *C. pubescens* being a plant of upland woods, *C. parviflorum* being found in swamps and bogs, in our region, where there are no swamps or bogs worthy of mention, specimens of both extremes are found, and intermediate specimens as well, so that it has seemed most scientific here to consider them as one variable species. Specimens: Spring Mt. Pk., May 2, 1897 (Towns.). Hillsides, Tryon, April 28, 1911 (Day). Tryon Mt., May 2, 1919, and Rocky Spur, May 8, 1919 (PT. nos. 0176, 0198).

255. **Cypripedium acaule** Ait. (Pink Lady's Slipper. Moccasin Flower)
Fissipes aculis Small

Common in piedmont and mountain woods, especially under pines. Specimens: Spring Mt. Pk., May 11, 1897 (Towns.). In pine woods, lower slopes of Rocky Spur, April 25, 1919 (PT. no. 0142). Pine woods, Warrior Mt., May 1918 (Millsp. no. 4070). Tryon, April 29, 1919 (Day).

256. **Orchis spectabilis** L. (Showy Orchis)
Orchis humilis Michx.
Galeorchis spectabilis Rydb.

Frequent in the Porter soils of cool forests, especially of the mountains. Specimens: Lower Shunkawawkin Falls, May 1, 1899, and Melrose, April 29, 1897 (Towns.). Pearson's Falls, April 18, 1919 (Day). Pacolet Gorge, April 12, 1919, and "Valhalla," April 20, 1922 (PT. nos. 089, 1633).

257. **Orchis clavellata** Michx. (Green Wood Orchis)
Habenaria clavellata Spreng.
Orchis tridentata Willd.
Gymnadeniopsis clavellata Rydb.

This inconspicuous little orchid is common in cool woods in summer, throughout, being frequent on dripping rocks, dead, mossy logs, etc., as well as on the ground. Specimens: Spring Mt. Pk., Aug. 3, 1897 (Towns.). Along a creek, in ferny woods, Tryon, July 19, 1921; summit of White Oak Mt., July 21,1 921; on dead, mossy logs, "Dark Corners,"

Aug. 13, 1921; on dripping rocks, Hogback, Aug. 14, 1921 (PT. nos. 978, 1041, 1230, 1250).

258. **Orchis ciliaris** L. (Orange Fringed Orchis)
Habenaria ciliaris R. Br.
Blephariglottis ciliaris Rydb.

Common in dry woods, throughout. Specimens: Spring Mt. Pk., Aug. 15, 1897 (Towns.). Forests, Howard's Gap, July 25, 1921 (PT. no. 1075). In July of 1919 a specimen from within the limits of the town of Tryon was sent me by Mr. Lawrence Doubleday.

259. **Pogonia divaricata** (L.) R. Br. (Snakemouth)
Arethusa divaricata L.
Caiëtes divaricata Ames.

This beautiful orchid is distinctly ephemeral; in some years it seems not to come up in the spot where it was found in other years. Yet it is not excessively rare. I found a specimen nodding above a railroad embankment a few rods from the Tryon station. Specimens: Spring Mt. Pk., June 22, 1899 (Towns.). Under *Pinus virginiana*, Godshaw Hill. June 4, 1919 (PT. no. 0316).

260. **Pogonia trianthophora** (Sw.) B.S.P.
Triphora pendula Nuttall
Triphora trianthophora Rydb.

This tiny orchid is rare, or exceedingly difficult to find. Specimens: Deep shade, rich humus, Pearson's Falls, Sept. 12, 1921 (PT. no. 1511). Side of Tryon Mt., Aug. 18, 1897 (Towns.).

261. **Pogonia verticillata** (Willd.) Nutt.
Arethusa medeoloides Pursh
Isotria verticillata Raf.
Odonectis verticillata Raf.

This curious little species is infrequent, in low piedmont woods. Specimen: near Columbus, July 27, 1921 (PT. no. 1083)

262. **Spiranthes gracilis** (Bigel.) Beck (Ladies' Tresses)
Neottia tortilis Pursh
Gyrostachys gracilis Ktze.
Ibidium gracile House

Common in woods, meadows, and even as a weed in lawns! A pretty and fragrant little orchid of singular appearance. Specimens: Side of Tryon range, Aug. 20, 1897 (Towns.). In lawns, Tryon, Aug. 8, 1921, and damp woods, Vaughan's Gap, Aug. 3, 1921 (PT. nos. 1109, 1233).

263. **Peramium pubescens** (Willd.) MacM. (Rattlesnake Plantain)
Satyrium venosum Raf.
Tussaca reticulata Raf.
Goodyera pubescens R. Br.
Epipactis pubescens A. A. Eaton
Epipactis reticulata House

Common in woods, throughout; it has a preference for pine woods, and is perhaps most at home in rather poor soils, but it is not unknown in richer deep loams. Specimens: Tryon, (in fruit) Jan. 22, 1919 (Day). Rich woods, "Valhalla," July 23, 1921 (PT. no. 1068).

264. **Malaxis unifolia** Michx. (Green Adder's-Mouth)
Achroanthes unifolia Raf.
Microstylis ophioglossoides Nutt.
Microstylis unifolia B.S.P.

A specimen of this curious little plant was sent me from the summit of White Oak Mt., by Mrs. Gertrude Ludlom, July 21, 1921.

265. **Liparis liliifolia** (L.) Richard. (Twayblade)
Ophrys liliifolia L.
Leptorchis liliifolia Ktze.
Anistylis Convallaria Raf.

A single specimen: Melrose, 1897 (Towns.). It blooms in June and July.

266. **Tipularia unifolia** (Muhl.) B.S.P. (Cranefly Orchis)
Limodorum unifolium Muhl.
Orchis discolor Pursh
Tipularia discolor Nutt.

This orchid of odd appearance is common in shady woods. Specimens: "Huston Farm" near Columbus, Aug. 11, 1897 (Towns.). Tryon, (in fruit) Jan. 11, 1918 (Day). Wet woods along Vaughan's Creek, July 19, and Aug. 28, 1921; Skuyuka Mt., at 1,500 ft., July 21, 1921 (PT. nos. 987, 1402, 1030).

267. **Aplectrum hyemale** (Muhl.) Torr. (Adam-and-Eve. Putty-root)
Aplectrum spicatum B.S.P.

Like some others of our orchids, this handsome little species is somewhat ephemeral, being at times and in places, not uncommon, again being absent or failing to make a showing for some time. Miss Wright has reported it as blooming in May, in woods above Glen Walden, hence right in the town of Tryon. Townsend's specimen from Melrose, June 24, 1897, is not in flower, but in fruit.

268. **Corallorhiza odontorhiza** Nutt. (Coral-root)
Ophrys Corallorhiza Nutt.

This curious saprophytic orchid is rather frequent in autumn in pine woods. Specimens: Columbus, Oct. 1897 (Towns.). On ground among pine-needles, on Rocky Spur, at 2000 ft., Sept. 6, 1921 (PT. nos. 1488, 1489).

269. **Corallorhiza Wisteriana** Conrad (Coral Root)

This little orchid, endowed with a fungus-like odor, is, perhaps because of its saprophytic character, perhaps because small enough to be easily overlooked, distinctly sporadic in appearance. Specimen: In leaf mold of the gardens, "Lyncote" hill, April 10, 1919 (PT. no. 068).

PART III. WILLOW FAMILY TO ROSE FAMILY (SALICACEAE-ROSACEAE)

Family 22. SALICACEAE (Willow Family)

270. **Populus alba** L. (White or Silver Poplar)

An ornamental tree introduced from Europe, and very commonly naturalized.

271. **Populus grandidentata** Michx. (Large-toothed Aspen).

There is a specimen of this handsome northern tree in the Greene Herbarium, collected on the high mountains near Saluda. It has never been collected by anyone else and must be rare.

272. **Salix nigra** Marsh. (Common or Black Willow)
Salix pentandra Walt.
Salix caroliniana Michx.
Salix ligustrina Michx. f.
Salix falcata Pursh

This tree willow is abundant along the courses of the streams well out on the piedmont, but it may also occur in the foothills and even, in shrubby form, along mountain streams. Specimens: On the Tryon range, (in flower) April 1, 1897; Spring Mt. Pk., (in fruit) May 11, 1897 (Towns.). In a marsh on top of the hills beyond the trestle, on the state line, (in flower) April 17, 1922; in wet ground of a low meadow, Tryon, (leaves and fruit) May 15, 1926 (PT. nos. 1626, 2136).

273. **Salix Babylonica** L. (Weeping Willow)

Common ornamental tree introduced from Europe and naturalized. Specimen: March 21, 1919 (PT. 05).

274. **Salix discolor** Muhl. (Glaucous Willow)
Salix eriocephala Michx.
Salix prinoides Pursh

Frequent along stream courses. Specimen: Banks of the Pacolet, and of Vaughan's Creek (Day).

275. **Salix interior** Rowlee (Sand-bar Willow)
Salix longifolia Muhl., not Lam.

Occasional along stream courses. Specimen from Tryon in the Greene Herbarium.

276. **Salix humilis** Marsh. (Prairie Willow)
Salix conifera Muhl.

A conspicuous shrub both of springy places and of dry ground, predominantly in the mountains and foothills. Specimens: Summit of Tryon Pk., (in flower) March 24, (in leaf) May 27, 1897 (Towns.). Springy places, Melrose Mt., April 10, 1923 (PT. no. 1802).

277. **Salix sericea** Marsh. (Silky Willow)

Frequent in moist woods and along stream courses. Specimens:

(In fruit) April 21, 1821 (Towns.). Along a brook, Tryon (in fruit) April 16, 1922 (PT. no. 1607).

278. **Salix viminalis** L. (Osier)

A pretty shrub, introduced from Europe and naturalized extensively along a tributary brook of the Pacolet, near "Valhalla." Specimens: May 12, 1919, July 23, 1921 (PT. nos. 0221, 1062).

Family 23. JUGLANDACEAE (Walnut Family)

279. **Juglans nigra** L. (Black Walnut)

This splendid tree is frequent throughout; usually it is found on the edge of a forest, or the center of a little meadow where it has room to attain its natural dimensions. Specimen: In a meadow, Tryon, (fruit) Aug. 9, 1921 (PT. no. 1128).

280. **Juglans cinerea** L. (Butternut)

A fine tree, and common throughout, oftenest in rich soils on mountain sides. Specimen: Rich woods, "Valhalla," Aug. 29, 1921 (PT. no. 1412).

281. **Carya ovata** (Mill.) K. Koch (Shagbark Hickory)
Juglans ovata Mill.
Carya alba Nutt.
Hicorius alba Raf.
Hicoria ovata Britton

This splendid species is rather frequent in rich soils of the mountain-sides and piedmont glens. Specimen: Dry ridges, mountains of Polk County (Ashe).

Var. *Holmesiana* Ashe.

This small-fruited extreme was collected in this county by Ashe with the typical species.

282. **Carya alba** (L.) Koch. (Mocker Nut. White-heart Hickory)
Juglans alba L.
Juglans tomentosa Lam.
Carya tomentosa Nutt.

Hicoria alba Britton
Hicoria tomentosa Raf.

A very common tree of the piedmont, and often in the mountains, found dominantly on sterile ridges. Specimens: Dry ridge south of the Golf Links, (sterile shoots) June 20, 1921, and Tryon, (fruit) Aug. 17, 1921 (PT. nos. 609, 610, 1274–1276).

283. **Carya glabra** (Mill.) Spach (Pignut. Broom Hickory)
Juglans glabra Mill.
Juglans porcina Michx. f.
Hicoria porcina Raf.

Common, especially on the piedmont, on hillsides and sterile sandy flats. Specimen: Dry ridge south of the Golf Links, (sterile shoots) June 20, 1921 (PT. no. 607).

Var. *villosa* (Sarg.) Robinson
Hicoria glabra var. *villosa* Sarg.
Hicoria villosa Ashe
H. pallida Ashe
Carya porcina var. *hirsuta* Ashe

According to Ashe this has been found on "dry ridges near the top of the Blue Ridge, Polk Co."

Family 24. BETULACEAE (Birch Family)

284. **Corylus americana** Walt. (Hazel-nut)

A frequent shrub, in dry ground, thickets and borders of woods, throughout. Specimens: Summit of Tryon Pk., June 27, 1897 (Towns.). Along the Pacolet Gorge, (in fruit) Aug. 9, 1921 (PT. nos. 1129, 1130).

285. **Ostrya virginiana** (Mill.) K. Koch (Hop Hornbeam)
Carpinus virginiana Mill.
Carpinus Ostrya americana Michx.
Carpinus Ostrya Marsh., not L.

This handsome tree is somewhat infrequent, and generally occurs with *Betula lutea*. It seems to be confined to rich soil in the mountains,

chiefly at the heads of shaded glens above 2000 feet. Specimens: In rich mountain forests, Melrose, (in fruit) Sept. 3, 1921 (PT. no. 1441).

286. **Carpinus caroliniana** Walt. (Hornbeam. Ironwood)
Carpinus americana Michx.
Carpinus Betulus virginiana Marsh.

This beautiful little tree is quite common, particularly in rich soils of the mountains, and in glens of the piedmont. Specimens: Columbus, (in flower) April 20, 1899 (Towns.). Along the Pacolet Gorge, (in fruit) Aug. 9, 1921 (PT. nos. 1124, 1133).

287. **Betula lenta** L. (Cherry, Sweet, or Black Birch)

This beautiful and useful tree is common, but only in a small zone on the higher mountains, in rich soil, deep shade, at the heads of glens. Specimen: Vaughan's Gap, between Hogback and Rocky Spur Mts., (sterile shoot) Aug. 13, 1921 (PT. no. 1234).

The common names for this and the other birches are in great confusion. Locally the preceding, on account of its cherry-colored bark, is called red birch, and even "Mountain Mahogany," but Gray's Manual assigns the name of red birch to *Betula nigra*, despite its Latin name. Coker & Totten, however, call *Betula nigra* black birch, but they also call the foregoing black birch. The common name, locally, for *Betula nigra* seems to be river bank birch.

288. **Betula lutea** Michx. f. (Yellow or Gray Birch)
B. carpinifolia Michx.
B. excelsa Pursh

This fine straight tree is, like the preceding, an inhabitant of the mountains, but is more abundant at higher altitudes, and belongs in the *Ostrya virginiana* zone. It is infrequent. Specimens: In rich woods high above Fishtop, Green River gorge, (in fruit) Aug. 30, 1921 (PT. nos. 1427, 1434).

289. **Betula nigra** L. (Black, Red, or River Birch).
Betula lanulosa Michx.
Betula rubra Michx. f.

Very common along the sandy banks of streams and rivers on the piedmont, not a foothill or mountain tree. Specimens: Tryon, (female

flowers and young leaves) April 25, 1911 (Day). Along the Pacolet, (sterile shoots) Aug. 9, 1921; in a wet meadow, Millspring, (male flowers) April 15, 1923 (PT. nos. 1122, 1123, 1849).

290. **Alnus rugosa** (Du Roi) Spreng. (Alder)
Betula-Alnus rubra Marsh.
Alnus serrulata Ait.
Alnus rubra Desf.
Alnus canadensis Lodd.

Abundant along stream courses and around springy places, throughout. Specimens: (Flowers) Jan. 27, 1919 (Day). Tryon, July 23, Aug. 11, (in fruit) Aug. 17, 1921 (PT. nos. 1065, 1159, 1160, 1283).

Family 25. FAGACEAE (Beech Family)

291. **Fagus grandifolia** Ehrh. (Beech)
Fagus sylvatica var. *atropunicea* Marsh.

This tree forms practically a zone of vegetation, having in association with it a characteristic cool-temperate flora. It is most abundant in the mountains, in cool shaded glens and rich soil, but it is also frequent in foothill glens and even on the piedmont. Specimens: Columbus, (in flower) April 27, 1899 (Towns.). Tryon, May 23, 1926 (PT. no. 2250).

Var. *caroliniana* (Loud.) Fernald & Rehder

This is the common variety on the piedmont; it reaches to the lower slopes of the mountains. In Gray's Manual this is called a coastal plain variety, but specimens in the Arnold Arboretum give it a rather general range. Specimens: In the Pacolet Gorge, north side of Melrose Mt., (fruit) Aug. 25, 1921 (PT. nos. 1379–1381).

292. **Castanea dentata** (Marsh). Borkh. (Chestnut)
Fagus-Castanea dentata Marsh.
Castanea vesca Gaertn. var. *americana* Michx.
Castanea vulgaris Lam. var. *americana* DC.

At the present writing this magnificent tree is still abundant. The chestnut-blight, however, has leapt a large tract of territory. Between ten and fifteen years ago it was introduced on nursery stock near

Flatrock and Saluda, so that Polk County is now one of the infection sources of the state. At present the disease is largely confined to the area south of Saluda. It will, however, inevitably destroy all our chestnuts. Specimens: Summit of Tryon Pk., where abundant, (flowers) June 27, 1897 (Towns.). Around Tryon, May 1918 (Millsp. no. 4058). In dry woods, "Dark Corners," (male flowers and young fruit) Aug. 14, 1921, and Little Warrior Mt., (flowers) June 30, 1921 (PT. nos. 1214, 797).

293. **Castanea pumila** (L.) Mill. (Chinquapin)
Fagus pumila L.
Castanea nana Muhl.
Castanea pumila var. *Ashei* Sudworth
Castanea pumila var. *margaretta* Ashe

This small tree or shrub, which is immune to the chestnut blight, is common throughout, on dry slopes and elevated table lands, but is more characteristic of the piedmont than of the mountains. Specimens: Fox Mt., June 2, 1897 (Towns.). Tryon, (fruit) Aug. 17, 1921 (PT. nos. 1284, 1285).

294. **Quercus alba** L. (White Oak)

This splendid tree is probably the commonest of its genus in our region. It flowers from about the first to the third week in April. Specimens: Glen near "Lyncote," (fruit) July 28, 1921 (PT. no. 1092).

295. **Quercus stellata** Wang. (Post Oak)
Quercus alba var. *minor* Marsh.
Quercus obtusilola Michx.
Quercus minor Sarg.

Generally, in this region, rather a stunted tree with tough wood, found chiefly in poor soil and used for fence rails. It does not compare with the preceding in usefulness and beauty. Specimen: in Greene Herbarium. Flowers in early April.

296. **Quercus Prinus** L. (Chestnut Oak)
Quercus Prinus var. *monticola* Michx.
Quercus montana Willd.

This highly valued tree is perhaps even more beautiful than *Q. alba*,

and often grows with it, being nearly as common, but will not tolerate the poor soils that the white oak will. It grows chiefly on the piedmont hills, and in rich soil on the mountains. Specimens: Tryon, (fruit) Aug. 9, 1921 (PT. no. 1131, 1132).

The preceding species are all of the subgenus *Lepidobalanus*, the White Oaks, of which the nomenclature is clear. The following oaks, the red or black oaks, of the section *Erythrobalanus* are so badly confused that when one uses any name he must make it clear, if he can, about what tree he is speaking.

First of all, the common English names are given at variance by various authorities, the chief differences being due to the fact that herbarium botanists and writers of books use other names than those that, in the southern states, country people, lumbermen, and others using the trees, employ. The terms red oak, Spanish oak, pin oak, scrub oak, are applied to various species. As for the "book name" scarlet oak, it is not locally used except by the learned. The terms employed here are those in local use.

The botanical fraternity has, if anything, made an even worse job of nomenclature, and the final confusion has been added by the late Prof. Sargent who interchanged so many names of oaks. Nothing is gained and much lost by this method, and the usage here followed is that of Gray's "Manual" and Coker & Totten's "Trees of North Carolina," thus preserving the traditional name in the face of any technical substitutions.

297. **Quercus rubra** L. (Red Oak)
Quercus borealis var. *maxima* Sarg.

This is a fine tree of the mountains and the foothill region, blooming in the middle of April. There is a specimen in the Greene Herbarium

298. **Quercus coccinea** Wang. (Pin Oak).

This tree is called by botanists "Scarlet Oak," but it is not a common name in the sense that it is generally used. "Spanish" is another name applied to it. It is abundant throughout, in various soils but perhaps most commonly in poor soils of crests and ridges. Specimens: Columbus, (flowers and young leaves) April 1897 (Towns.). Tryon, May 1918 (Millsp. no. 4055). Tryon, (flowers) April 5, 1919 (Day).

299. **Quercus velutina** Lam. (Red or Black Oak)
Quercus nigra Du Roi
Quercus discolor Ait.
Quercus tinctoria Michx.

This splendid dark-barked tree is frequent throughout. Red Oak

is a common name hereabouts, but this fails to distinguish it from *Quercus rubra*. Specimens: Tryon, from the Greene Herbarium. Columbus, (flowers) March 26, 1897 (Towns.).

300. **Quercus falcata** Michx. (Spanish or Red Oak).
Quercus triloba Michx.
Quercus cuneata Wang.
Quercus nigra var. *digitata* Marsh.
Quercus digitata Sudw.

This large and common tree with grey bark is frequent throughout, and makes a fine showing in autumn. It is long lived and often attains fine dimensions. Specimens: Tryon, from the Greene Herbarium. Columbus, (flowers) April 26, 1897 (Towns.).

301. **Quercus pagodaefolia** (Ell.) Ashe. (Swamp Spanish Oak)
Quercus pagoda Raf.
Quercus falcata var. *pagodaefolia* Ell.

This is a tree of the moist bottomlands of the eastern part of the county. Specimens: Columbus, in the Greene Herbarium. "The Shoals," May 1918 (Millsp. no. 4056).

302. **Quercus marilandica** Muench. (Black Jack Oak. Scrub Oak)
Quercus ferruginea Michx. f.

This common, knotty tree with big leaves is usually considered somewhat despicable; nevertheless it makes a fine showing in many places in our region, in poor, thin soil of the Cecil series. Specimens: "On the new mountain road," near Columbus, (flowers and young leaves) April 21, 1897 (Towns.). Tryon, (flowers and young leaves) April 9, 1911 (Day).

303. **Quercus nigra** L. (Water Oak).
Quercus aquatica Walt.

This tree with small, untoothed leaves, is found in moist bottom lands, especially in the eastern part of the county. Specimens: Columbus, from the Greene Herbarium, and "The Shoals," May 1918 (Millsp. no. 4054). The botanical names of this and the preceding are interchanged.

304. **Quercus heterophylla** Michx. f. (Bartram Oak)

There is a specimen, from beyond Columbus, of this very curious species, in the Greene Herbarium. It is thought to be a cross between *Q. Phellos* and *Q. velutina*, or *Q. Phellos* and *Q. rubra*. *Quercus Phellos* has not yet been collected here but it quite probably occurs in this county. Mr. Greene's specimen of "*Q. texana*" in the herbarium at the public school is probably a leaf of *Q. coccinea*.

Family 26. ULMACEAE (Elm Family)

305. **Ulmus americana** L. (American or White Elm)
Ulmus mollifolia Marsh.

This stately tree is very rare in our area, unless it may occur more abundantly in the little-known alluvial courses of the larger streams in the eastern part of the county. Pinchot and Ashe in their "Timber Trees of North Carolina" show it as reaching its westernmost limit in the state in our area. A single specimen: "Mountainsides" (an odd habitat!), (young fruits) March 22, 1897 (Towns.).

306. **Ulmus fulva** Michx. (Slippery Elm)
?Ulmus pubescens Walt.
Ulmus americana Marsh., not L.
Ulmus rubra Michx. f.

Infrequent, in low grounds, or near the foot of hills, or on the lower mountains. Specimen: On a hill, near the base of Glassy Mt., a large tree, Sept. 1, 1921 (PT. no. 1433). The winged elm, *Ulmus alata*, is recorded as occurring on the borders of our area (Chimney Rock) by Pinchot and Ashe.

307. **Celtis georgiana** Small. (Hackberry)

Occasional, along the courses of the larger streams, and occurring to the foot of the mountains. Coker and Totten in "Trees of North Carolina" record this as a shrub, but it is at least sometimes with us a large tree. Specimen: A large tree in open ground, "Valhalla," (in fruit) Aug. 25, 1921 (PT. nos. 1377, 1378). Flowers in April. Greene's specimen in the public school of "*Celtis occidentalis*" is this species.

Family 27. MORACEAE (Mulberry Family)

308. **Morus rubra** L. (Red Mulberry)

Ordinarily this is a small tree or shrub, but some of our specimens reach very large size. It is common especially in rich woods of the foothill region. Specimens: Tryon, May 1899 (Church.). Side of Tryon range, (in flower) April 20, and (leaves) May 19, 1897 (Towns.). Tryon, May 1918 (Millsp. no. 4051). A large tree, foot of Melrose Mt., on the banks of the Pacolet where it emerges from the mountains, (in flower) April 19, 1922; big tree, Pacolet Valley, Aug. 20, 1921; small tree in thickets, Tryon, (fruit) Aug. 27, 1921 (PT. nos. 1643, 1095, 1404).

309. **Morus alba.** L. (White Mulberry)

Introduced from Europe, much planted around old farmsteads, and escaped and naturalized. Specimen: Near an old farmhouse, Fishtop, (leaves) Aug. 31, 1921 (PT. no. 1428). Flowers in May.

310. **Papyrius papyrifera** (L.) Ktze. (Paper Mulberry)
Morus papyrifera L.
Broussonetia papyrifera Vent.

Very commonly planted around old farm yards; introduced from Europe and frequently escaped. Flowers in May. Beside these there occurs in the Greene Herbarium a specimen of the Osage Orange, *Maclura* (*Toxylon*) *pomiferum*, a native of the lower Mississippi Valley states, often cultivated and perhaps sometimes escaped, but the specimen under discussion seems to be one of those that the old naturalist collected in his last years, when he included numerous purely cultivated things, like *Mahonia*.

Family 28. URTICACEAE (Nettle Family)

311. **Boehmeria cylindrica** (L.) Sw. (False Nettle)
Urtica cylindrica L.

Common in muddy shaded ground, along ditches, edges of meadows of Congaree soils. Specimen: Tryon, Aug. 23, 1921 (PT. no. 1354).

312. **Laportea canadensis** (L.) Gaud. (Wood Nettle)
Urtica canadensis L.
Urtica divaricata L.
Urticastrum divaricatum Ktze.

Common throughout in rich soils, either in low grounds of Congaree meadows, or in moist mountain forests soils of the Porter series. Specimens: In rich woods, "Valhalla," Aug. 25, 1921; in low wet ground near Erskine's millpond, July 23, 1921 (PT. no. 1389, 1053).

313. **Pilea pumila** (L.) Gray. (Clearweed. Richweed)
Urtica pumila L.
Adicea pumila Raf.

Common in wet muddy places of the Congaree meadows or sometimes in more upland spots, growing with *Boehmeria*, *Laportea*, and *Impatiens*. Specimens: Columbus, (in fruit) Oct. 1899 (Towns.). Tryon, Aug. 23, 1921 (PT. nos. 1345–1347).

Family 29. LORANTHACEAE (Mistletoe Family)

314. **Phoradendron flavescens** (Pursh). Nutt. (Mistletoe)
Viscum flavescens Pursh

Common throughout, parasitic on *Oxydendrum*, *Nyssa*, *Quercus*, *Prunus*, etc. Flowers from May–July. Specimens: Tryon (immature fruit) Aug. 24, 1921; Tryon, (mature fruit) Dec. 21, 1920 (PT. nos. 1370, 1556).

Family 30. SANTALACEAE (Sandalwood Family)

315. **Pyrularia pubera** Michx. (Buffalo Nut)
Hamiltonia oleifera Muhl.

Common along the courses of streams in the mountains and foothills, parasitic chiefly on *Calycanthus*. Specimens: Near Saluda, May 17, 1897 (Towns.). Along Vaughan's Creek, April 16, 1922; along the lower Pacolet, (in fruit) Aug. 17, 1921 (PT. nos. 1622, 1270–1273).

Beside the curious foregoing plant, the parasitism of which is probably only partial, as it has green leaves and shows no characteristic degenerative signs, there are other members of this strange family which so closely approach our

borders as to make it nearly certain that they will be found within them. *Comandra umbellata*, bastard toad-flax, occurs in Henderson Co., on the west, and *Nestronia umbellula* is found in Spartanburg County on the south.

Family 31. ARISTOLOCHIACEAE (Dutchman's Pipe Family)

316. **Asarum rubrocinctum** sp. nov.

Foliis ad 17 cm. latis, reniformis, superne nitens, minute pubescentibus; inferne subglabris, nervis pilosis exceptis; calyce magno, tuba 3–8 mm. longa, lobis 18–50 mm. longis, rubrocinctis.

The primary characteristics of this new species are: leaves up to 17 cm. broad, kidnev-shaped; upper surface with a minute and shining pubescence; lower surface with long hairs on the veins, but the rest of the surface minutely and sparsely hairy; calyx very large, the tube 3–8 mm. long; lobes more or less erect-inflated into the form of a throat for 14–16 mm., then spreading, the spreading limbs 18–50 mm. long, including the caudate-acuminate tips. Throat internally yellowish white except for the purple-crimson streaks down the middle and margin of each calyx lobe, and for a heavy border of the same color around the top of the throat and, similarly, at the bottom of the tube, around the base of the ovary. Leaves two to each node, deciduous. At least one, and often three, awl-shaped petals present.

This species most resembles *Asarum acuminatum* of the Middle West and *A. caudatum* of the Pacific Coast. It has larger flowers than *A. acuminatum* and much less pubescent leaves. From *A. caudatum* it differs in having larger and broader and less pubescent leaves, and differently colored flowers. It is strikingly unlike *A. canadense* and *A. reflexum*, as its flowers are much larger, with extremely long lobes and its leaves are far larger and smoother.

When seen in the field this species was recognized even at a distance as distinctly unlike any of its relatives. A prolonged search of herbarium material has revealed nothing like it except a specimen of Homer House's, no. 10018, from Oneida, Madison Co., June 11, 1924. In the herbarium the flowers of this genus wither and deform badly and the size and coloring of the specimens of this species are largely lost in herbarium material. In alcohol the coloring is extracted though the form is preserved.

This beautiful plant is rather frequent around Tryon. The type station is at the side of the waterfall at Pearson's Falls, Melrose, N. C., but Miss Kimber in 1928 kindly collected a large series of specimens

of it for me, proving that it comes from many places around Tryon, and further furnished me with living plants for fresh study and planting out in my garden.

Specimens: Gorge below Pearson's Falls, April 18, 1919 (Day). Pearson's Falls, beside the waterfall, and continually moistened by its spray, May 17, 1926 (PT. no. 2191). Pearson's Falls, and elsewhere in rich forest soil of the mountains and foothills, May 1928 (Kimber).

317. **Asarum acuminatum** (Ashe) Bicknell (Wild Ginger. Monkey-jug. Asarabacca)
A. canadense L. var. *acuminatum* Ashe

This interesting species is treated in Gray's "Manual" as differing merely in having caudate-acuminate calyx segments, but this is due to a poor understanding of the living plant; herbarium specimens of *Asarum*, as is usual in fleshy-flowered plants, are deformed and deceptive. Small in his "Flora of the Southeastern States" has properly delineated this species, which has more pubescent leaf blades, these 7–14 cm. broad, densely cinereous tomentose beneath, the larger nerves usually somewhat bristly; sepals gradually caudate-acuminate or flagellate-tipped, with termination recurved-spreading, 1–2 cm. long, dull brownish purple. However, Small gives the range as Wisconsin and Minnesota, south to Tennessee, but there are several specimens from Western North Carolina. Our specimen is from Melrose, April 12, 1928 (Kimber).

318. **Asarum virginicum** L. (Wild Ginger. Monkey Jug. Asarabacca)
Hexastylis virginica Small

Common in dry woods. Specimens: Tryon, March 17, 1911 (Day). Dry woods, Tryon, April 18, 1923 (PT. no. 1856).

319. **Asarum heterophyllum** Ashe (Wild Ginger. Monkey Jug. Asarabacca)
Hexastylis heterophylla Small

Occasional in woods. Specimen: Tryon, April 10, 1928 (Kimber).

320. **Asarum Memmingeri** Ashe (Wild Ginger. Monkey Jug. Asarabacca)
Hexastylis Memmingeri Small

Frequent in rich woods. Specimens: Tryon, May 1899 (Church.). Tryon, April 10, 1928 (Kimber).

321. **Asarum grandiflorum** (Michx.) Small (Wild Ginger. Monkey Jug)
A. Shuttleworthii Britton
Hexastylis Shuttleworthii Small
Asarum macranthum Small
Homotropa macranthum Shuttlw.

This beautiful species is rare in woods. Specimen: "Jones's Folly under laurels," May 1918 (Millsp. no. 4133).

322. **Asarum arifolium** Michx. (Wild Ginger. Monkey Jug. Asarabacca)
Hexastylis arifolia Small

Perhaps the commonest species, found in upland forests throughout, but especially in the foothills and on the piedmont. Specimens: In dry soil, Millspring, April 15, 1923; in the woods on Leitner's Hill, May 1, 1926 (PT. nos. 1847, 2119). Tryon, May 1918 (Millsp. no. 4122). Tryon, April 10, 1928 (Kimber).

323. **Asarum Ruthii** Ashe (Wild Ginger. Monkey Jug. Asarabacca)
Hexastylis Ruthii Small

This species is a modern segregate of the old species *A. arifolium*, just as *A. heterophyllum* is a segregate of *A. virginicum*, and *A. acuminatum* of *A. canadense*. Whether these species are really meritorious or not has long been a matter of discussion. Herbarium workers and compilers have inclined to regard them as negligible; southern field botanists see them as clearly distinct. In most genera differences in the shape of the corolla are not highly regarded as diacritical characters. To the writer it seems that in the genus *Asarum* the critical characters are found in this very point and after some years of study he is inclined to honor most of the species described from the southern states. This particular species, however, is one of the doubtful cases. Specimens belonging under this species grow with or in the same habitat as *A. arifolium*. Specimens: In rich soil, "The Shoals," May 1918 (Millsp. no. 4109). Tryon, April 20, 1911 (Day). On the hills beyond the trestle, on the state line, April 20, 1923 (PT. no. 1875).

324. **Aristolochia serpentaria** L. (Virginia Snakeroot).

This curious little medicinal herb is our only representative of this interesting tropical genus. Its tiny little S-shaped flowers are apt to be overlooked. Rare, in rich soil of mountain forests. Specimen: Pearson's Falls, May 26, 1927 (Wherry). In addition to this our flora may possibly include another species, *Aristolochia macrophylla* Lam. (*A. Sipho* L'Her.), the Dutchman's Pipe vine, conspicuous for its curious curved flowers and its big leaves and high-climbing stems. John Donnell Smith collected it on Aug. 9, 1881, at the "Falls of the Saluda River" in Greenville Co., close to our western borders.

Family 32. POLYGONACEAE (Buckwheat Family)

325. **Rumex Acetosella** L. (Field, Red, or Sheep Sorrel)
Acetosella Acetosella Mill.

Abundant in cultivated ground, and even on mountain tops where there has been grazing. Naturalized from Europe. Specimens: Tryon, May 1918 (Millsp. no. 4126). Godshaw Hill, May 23, 1926 (PT. no. 2224).

326. **Rumex crispus** L. (Curly Dock)

A common weed of European origin. Flowers in early summer.

327. **Polygonum tenue** Michx. (Knotweed)

A common little native weed, found both in cultivated ground and in more virgin habitats. Specimen: Spring Mt. Park, Aug. 15, 1897 (Towns.).

328. **Polygonum aviculare** L. (Knotweed)
Common everywhere as a dooryard and footpath weed; probably also native.

329. **Polygonum pennsylvanicum** L. var. **genuinum** Fernald (Smartweed)

In dry open soil, frequent. Specimen: Godshaw Hill, Nov. 23, 1926 (PT. no. 2383).

330. **Polygonum Persicaria** L. (Lady's Thumb. Heartweed)
Persicaria mitis Gilib.
Persicaria Persicaria Small

A common weed of dooryards, waste ground, cultivated grounds, naturalized from Europe. Specimen: Tryon, May 23, 1926 (PT. no. 2272).

331. **Polygonum virginianum** L. (Virginia Knotweed)
Tovara virginiana Raf.

Frequent in rich shaded soil, throughout. Specimens: Spring Mt. Pk., Aug. 7, 1897 (Towns.). Rich woods, "Valhalla," July 29, 1921 (PT. nos. 1050–1052).

332. **Polygonum sagittatum** L. (Tear-thumb)
Tracaulon sagittatum Small.

Frequent in low wet thickets on the piedmont, especially eastward.

333. **Polygonum cilinode** Michx. var. **laevigatum** Fernald (Bindweed)

This variety has been found previously only in West Virginia, so far as the writer knows; it is at least the first North Carolina record of it. Specimen: High-climbing over herbs, on moist banks, Melrose, (flowers and fruit) Sept. 12, 1291 (PT. no. 1490).

334. **Polygonum Convolvulus** L. (Black Bindweed)
Helxine Convolvulus Raf.
Bilderdykia Convolvulus Dumort
Tiniaria Convolvulus Webb. & Moq.

A common field weed, naturalized from Europe. Specimens: Railway embankment, (fruit) June 29, 1921; in gardens, Tryon, (fruit) July 25, 1921 (PT. nos. 763, 764, 1071).

335. **Polygonum dumetorum** L. forma **cristatum** (Engelm. & Gray) Robinson. (Climbing False Buckwheat)
Tiniaria cristata Small

Occasional in woods and thickets. Specimen: Side of Tryon range, 1897 (Towns.). Blooms in late summer. It is generally considered that the true species is naturalized from Europe, but that this form is

native. The true species has not been discovered here and it is doubtful if it occurs.

336. **Polygonum orientale** L. (Prince's Feather)
Persicaria orientalis Spach.

Introduced from Asia, cultivated, and escaped around old dwellings. Summer.

337. **Fagopyrum esculentum** Moench (Buckwheat)
Polygonum Fagopyrum L.
Fagopyrum vulgare Hill.
Fagopyrum Fagopyrum Karst.

Somewhat grown as a crop plant, introduced from Europe, and frequent as a harmless weed in ploughed ground, gardens, etc. Summer.

Family 33. CHENOPODIACEAE (Goosefoot Family)

338. **Chenopodium album** L. (Lamb's Quarters. White Goosefoot. Pigweed)

Common weed, naturalized from Europe. Summer. Specimen: Farmyard, Tryon, (fruit) Nov. 6, 1926 (PT. no. 2380).

Var. *viride* (L.) Moq.
A specimen of this was taken with the above (PT. no. 2381).

339. **Chenopodium ambrosioides** L. (Mexican Tea)

Naturalized from American Tropics. In waste ground. Summer. Specimen: Columbus, 1897 (Towns.).

Family 34. AMARANTHACEAE (Amaranth Family)

340. **Amaranthus hybridus** L. (Green Amaranth. Pigweed)

A common barnyard weed, naturalized from American Tropics. Summer.

Family 35. PHYTOLACCACEAE (Pokeweed Family)

341. **Phytolacca decandra** L. (Pokeweed)
Phytolacca americana L.

Common in fields and light thickets, a well known "greens" edible before the purple sap ascends in the stems and leaves, but thereafter poisonous like the root. Specimen: By the roadside, on Little Warrior Mt., May 10, 1919 (PT. no. 0303).

Family 36. MOLLUGINACEAE (Carpet-weed Family)

342. **Mollugo verticillata** L. (Carpet-weed).

This weedy little plant is common in cultivated ground and sandy open soil, blooming in summer. It is not certainly native in this county, though a native of the southern states. Specimen: Columbus, 1897 (Towns.).

Family 37. CORRIGIOLACEAE (Knotweed Family)

343. **Anychia dichotoma** Michx. (Forked Chickweed)
Queria canadensis L.
Queria dichotoma Moench
Anychia capillacea Nutt.
Anychia canadensis B.S.P. not Ell.

This curious little plant is infrequent, in mountain forests. Specimen: Side of Tryon Mt., June 11, 1897 (Towns.).

344. **Anychia polygonoides** Raf. (Forked Chickweed)
Anychia canadensis Ell.
Anychia dichotoma of auths. not Michx.
Paronychia canadensis Wood.

Rare and local, but commoner than the preceding. Specimens: Tryon Pk., June 30, 1897 (Towns.). Under *Tsuga caroliniana*, and growing with *Selaginella rupestris* and *Panicum tsugetorum*, at "The Narrows," White Oak Mt., July 25, 1921 (PT. nos. 1017–1019, 1078–1080).

Family 38. SILENACEAE (Pink Family)

345. **Sagina procumbens** L. (Pearlwort)

An inconspicuous little plant occurring in a native state in woods and by forest brooks but rarely noticed here. It has however taken up a

habitat in brick walks around houses where it is frequent as a weed. Specimens: Melrose, May 17, 1897 (Townsend). In a brick walk, Tryon, April 20, 1923 (PT. no. 1854).

346. **Arenaria leptoclados** Guss. (Sandwort)

In cultivated land, naturalized from Europe. Specimen: Tryon, April 8, 1919 (Day).

347. **Arenaria serpyllifolia** L. (Sandwort)

In cultivated or open soil, naturalized from Europe. Specimen: In clay soil, Tryon, May 23, 1926 (PT. no. 2216).

348. **Stellaria media** (L.) Cyrill (Common Chickweed)
Alsine media L.

A common lawn weed, naturalized from Europe. Specimens: Tryon, April 10, 1923, and May 28, 1920 (PT. nos. 1839, 2232–2234).

349. **Stellaria graminea** L. var. **latifolia** Peterm. (Starwort)

A pretty and harmless little weed, native of Europe. Specimen: Along the railroad embankment, Tryon, May 6, 1926 (PT. no. 2144).

350. **Stellaria pubera** Michx. (Starry Chickweed)
Alsine pubera Britton

This beautiful little plant is common in rich forest soil especially in or near the mountains, and often on dripping rocks. Specimen: Pearson's Falls, April 10, 1923 (PT. no. 1825).

351. **Stellaria caroliniana** sp. nov. (Chickweed)
S. puberae similis, sed caulis longior, tenuoir; cymae diffusae; flores fructusque parvuli; folia parvula; sepala petalis longiora.

Related to *S. pubera*, but the pubescence shorter and sparser, the stems much longer and more slender; inflorescence more diffuse and the flowers and fruit smaller; leaves much smaller.

Stems long, straggling, pubescent in 2 lines; internodes 6–20 cm. long; leaves sessile or subsessile, elliptical, broadest just above the base, smooth, not even ciliate, not over 2 cm. long nor 1.5 cm. broad; flowers in little leafy-bracted cymes or umbels, often very long; pedicels ap-

pressed-pubescent, very slender, 8–12 mm. long; bracts herbaceous; sepals bluntish, papillose but not pubescent; petals shorter, deeply bifid; styles 3; stamens —; capsule ovate, equalling or a little exceeding the sepals; seeds small, orange-brown, roughened.

Type specimens: In moist woods along Vaughan's Creek, below Godshaw Hill, May 3, 1926 (PT. no. 2130).

This species appears to be a local offshoot of *S. pubera*, though superficially it bears resemblances to *S. graminea* and *S. longifolia;* the leaf shapes and pubescence, however, bring it closest to *S. pubera.*

352. **Cerastium vulgatum** L. var. **hirsutum** Fries. (Mouse-ear Chickweed)

Common lawn and dooryard weed, naturalized from Europe. Specimen: Tryon, April 10, 1923 (PT. no. 1837).

353. **Cerastium viscosum** L. (Mouse-ear Chickweed)

An occasional weed, naturalized from Europe. Specimen: In cultivated land, Tryon, April 5, 1919 (Day).

354. **Silene antirrhina** L. (Sleepy Catchfly)
Ebraxis virgata Raf.

Common in dry open soil on the piedmont, and as a meadow weed. Specimen: Dry meadow, Godshaw Hill, May 6, 1926 (PT. no. 2133).

355. **Silene stellata** (L.) Ait. f. (Starry Campion)
Cucubalus stellata L.

Common in mountain woods. Specimens: Spring Mt. Pk., July 23, 1897 (Towns.). Rich woods, Skuyuka Mt., July 21, 1921 (PT. nos. 1014, 1015).

356. **Silene virginica** L. (Fire Pink. Mountain Pink. Devil's Lantern).
Silene Catesbaei Walt.

This beautiful species is common in the Porter soils, under shade. Specimens: Side of the Tryon range, March 21, 1897 (Towns.). Tryon, April 9, 1919 (Day). Saluda, May 1899 (Church.). Mountainsides, Saluda, May 1918 (Millsp. no. 4086). On the highway below Melrose, June 30, 1921 (PT. no. 799).

357. **Agrostemma Githago** L. (Corn Cockle)
Lychnis Githago Scop.

A common meadow weed, naturalized from Europe. Seeds poisonous. Specimen: Godshaw Hill, May 23, 1926 (PT. no. 2230).

358. **Lychnis alba** Mill. (White Campion)
Lychnis vespertina Sibth.

A common weed of cultivated grounds, new lawns, etc. Specimen: Lawns of "The Mountain Industries," May 6, 1926 (PT. no. 2141).

359. **Saponaria officinalis** L. (Soapwort. Bouncing Bet)

An infrequent weed, introduced from Europe, as an old-fashioned garden flower, escaped, and naturalized. Summer.

Family 39. PORTULACACEAE (Portulaca Family)

360. **Portulaca oleracea** L. (Purslane).

A common dooryard weed, introduced from Europe, and naturalized. Summer.

361. **Claytonia virginica** L. (Spring Beauty)

Infrequent, or at least so ephemeral as not to be commonly noticed. In the Porter soils, deep shade. Specimens: Deep cool woods, Pacolet Gorge, April 14, 1919 (PT. no. 0113). "Dark Corners," April 2, 1928 (Kimber).

Family 40. RANUNCULACEAE (Buttercup Family)

362. **Zanthorhiza apiifolia** L'Her. (Yellow-root).

Common by streams and found throughout, but most abundant in the foothills. Popularly used for sore throat and as a tonic and bitters. It yields a yellow dye, and is well known in gardens as a border plant. Specimens: Tryon, April 5, 1897 (Towns.). Tryon, April 6, 1911 (Day). Tryon, May 1918 (Millsp. no. 4102). Tryon, May 1899 (Church.). By brooks, "Thousand Pines," (fruit) June 29, 1921; near Millspring, April 5, 1923; below Godshaw Hill, May 1, 1926 (PT. nos. 779, 1844, 2124).

363. **Cimicifuga americana** Michx. (American Bugbane)
Thalictrodes americana Ktze.

This species is an Appalachian endemic, and is striking from its habit of blooming in autumn. It prefers rich, shaded soils. Specimen: Hogback Mt., Sept., 17, 1927 (Wherry).

364. **Cimicifuga racemosa** (L.) Nutt. (Black Snakeroot. Black Cohosh).
Actaea racemosa L.
Macrotrys actaeoides Raf.
Cimicifuga serpentaria Pursh.

This beautiful plant, often cultivated, is locally called "Popcorn spikes." It prefers rich soils, in shade or along river thickets. Specimens: Banks of the Pacolet, below "Lyncote," June 20, 1921; Vaughan's Creek, (fruit) July 19, 1921; rich woods, Tryon, (fruit) Aug. 9, 1921; rich glen, Melrose, (fruit) Aug. 8, 1921 (PT. nos. 600, A, B, 601, A; 989, 1135, A; 1098).

365. **Actaea alba** (L.) Mill. (White Baneberry)
A. spicata var. *alba* L.
A. pachypoda Ell.

Rare, in rich soil of the foothills. Blooms in April. Specimen: In a damp glen near Lynn, (fruit) June 2, 1919 (PT. no. 0277).

366. **Aquilegia canadensis** L. (Wild Columbine)

This beautiful flower is common throughout in forest loam. Specimens: Tryon Range, April 26, 1899 (Towns.) Tryon, March 29, 1919 (PT. no. 045). Summit of Hogback Mt., May 27, 1927 (Wherry). These specimens were remarkable for having glandular stems. No other differences appeared, however. The flowers are sometimes found, on the higher mountains, in bloom into July.

367. **Aquilegia vulgaris** L. (Garden Columbine)

Introduced from Europe, and escaped. Specimen: Tryon, May 1918 (Millsp. no. 4049).

368. **Anemonella thalictroides** (L.) Spach. (Rue Anemone)
Thalictrum anemonoides Michx.
Anemone thalictroides L.
Syndesmon thalictroides Hoffmg.

Very common in woods, throughout. Specimens: Side of Tryon range, Mar. 24, 1897 (Towns.). Tryon, May 1899 (Church.). Tryon, May 1918 (Millsp. no. 4093). Woods, Tryon, April 10, 1923 (PT. no. 1838).

369. **Hepatica americana** (DC.) Ker. (Liverleaf)
Hepatica triloba var. *obtusa* Pursh
Hepatica triloba of auths., not Chaix.
Hepatica Hepatica of auths., not *Anemone Hepatica* L.

Common throughout in forest soils. Specimens: "Huston Place" near Columbus, June 4, 1899 (Towns.). Dry woods, Tryon, March 21, 1919 (PT. no. 09).

370. **Hepatica acutiloba** DC. (Liverleaf)
Hepatica triloba var. *acuta* Pursh
Hepatica acuta Britton

Frequent in forests. Specimen: Tryon, March 24, 1919 (PT. no. 028).

371. **Anemone virginiana** L. (Thimbleweed)

Common throughout in woods. Specimens: White Oak Mt., April 2, 1897; Tryon Pk., April 30, 1897; Tryon range, June 19 and June 30, 1897 (Towns.). Shaded hillsides, "Lyncote," June 20, 1921; Melrose, June 27, 1921 (PT. nos. 613, 721).

372. **Anemone quinquefolia** L. (Windflower. Wood Anemone)
Anemone pedata Raf.

Common in woods throughout. Specimens: "Huston Farm," near Columbus, March 3, 1897; Spring Mt. Pk., March 15, 1897 (Towns.). Pearson's Falls, April 10, 1923 (PT. no. 1818).

373. **Anemone trifolia** L. (Windflower. Mountain Anemone).

This dainty little species, which also grows in Europe, is rare with us. Specimen: Melrose Mt., April 17, 1911 (Day).

374. **Clematis ochroleuca** Ait.
C. sericea Michx.
Viorna ochroleuca Small

Infrequent, in sandy copses. Specimens: Lynn, April 19, 1919 (PT. no. 0131). Poor's Ford, May 1900 (Towns.).

375. **Clematis Viorna** L. (Leather-flower)
Viorna Viorna Small
Viorna urnigera Spach

Common in the mountains and foothills. Specimens: Columbus, June 15, 1897; "Huston Farm," July 3, 1897 (Towns.). Lynn, May 28, 1898 (Church.). Three miles north of Millspring, May 27, 1927 (Wherry).

376. **Clematis paniculata** Thumb.

Introduced from Japan and cultivated, sometimes escaped. Specimen: Fence-rows, Tryon, May 23, 1926 (PT. no. 2268).

377. **Clematis virginiana** L. (Woodbine. Virgin's Bower)
Clematis canadensis Mill.
Clematis virginica Pursh

Common, rampant over bushes, in sunny thickets; leaves highly variable in shape. Specimen: Melrose, Aug. 8, 1921 (PT. no. 1103).

378. **Ranunculus sceleratus** L. (Buttercup)

In moist soil. Specimen: Tryon, April 1, 1919 (054).

379. **Ranunculus abortivus** L. (Buttercup)

In moist soil and by brooks and rivers. Specimens: Along the Pacolet, Lynn, May 23, 1899 (Towns.). Pearson's Falls, May 11, 1926 (PT. no. 2161).

380. **Ranunculus recurvatus** Poir. (Buttercup)
Ranunculus lanuginosus Walt.
Ranunculus saniculaeformis Muhl.

Very common in moist woods, low meadows, and by springs and brooks. Specimens: Side of Tryon range, April 17, 1897 (Towns.).

Rich woods, Valhalla, April 19, 1922; Pacolet Gorge, April 20, 1923; Pearson's Falls, (fruit) June 27, 1921; wet ground on the Landrum road, May 5, 1926 (PT. nos. 1654, 1861, 709, 2137).

Var. *fontinalis* var. nov.

Glaber, axillis nervosum et nervis exceptis; petala sepala subaequalia. Glabrous but for a few hirsute tufts in the axils, and on the veins, on the lower sides of the leaves; petals nearly as long as the sepals. Type specimens: In a waterfall, April 9, 1919 (Day). In a waterfall, Melrose Mt., April 3, 1919 (PT. 068). Pearson's Falls, in the water, May 11, 1926 (PT. no. 2188).

381. **Ranunculus fascicularis** Muhl. (Buttercup)

In moist ground in the mountains. Specimens: In a waterfall, Melrose Mt., April 21, 1919 (PT. no. 0133). Melrose Mt., April 17, 1911 (Day).

382. **Ranunculus septentrionalis** Poir. (Buttercup)

In low moist soil. This is found in Miss Wright's list; it occurs in Henderson Co., and is undoubtedly present here. Blooms in late spring and early summer.

383. **Ranunculus hispidus** Michx. (Buttercup).

In rich soil of upland woods. Specimen: Columbus, April 28, 1899 (Towns.).

384. **Ranunculus acris** L.

A handsome weed of European origin. Specimen: Meadows, Tryon, May 23, 1926 (PT. no. 2257).

385. **Thalictrum clavatum** DC. (Meadow Rue)

This beautiful little Appalachian species is common by mountain and foothill streams, and on dripping rocks. Specimens: Side of Tryon range, April 24, 1899 (Towns.). Skuyuka, May 1899 (Church.). On dripping rocks, Pearson's Falls, June 27, 1921 and April 20, 1922; Glen Walden, May 6, 1926 (PT. nos. 695, 696, 1677, 1684, 2148).

386. **Thalictrum coriaceum** (Britton) Small. (Meadow Rue)

A handsome Appalachian species, on moist, shaded slopes of the higher mountains. Specimen: Hogback Mt., May 27, 1927 (Wherry).

387. **Thalictrum macrostylum** (Shuttlw.) Small & Heller. (Meadow Rue)

This species, said to inhabit "limestone sinks," was collected here but once, in what was certainly no limestone sink. Specimen: Low wet woods, "The Shoals," Aug. 20, 1921 (PT. nos. 1313, 1317).

388. **Thalictrum dioicum** L. (Meadow-rue)
Thalictrum laevigatum Michx.

Frequent in mountain woods. Specimens: Side of Tryon range, April 17, 1899 (Towns.). Mountain woods, May 1918 (Millsp. no. 4173). Mountain woods, April 20, 1922 (PT. no. 1667).

389. **Thalictrum revolutum** DC. (Meadow-rue)
T. purpurascens var. *ceriferum* Austin

Common in woods, especially in the mountains. Specimens: Tryon, May 1899 (Church. as "*T. purpurascens*"). Tryon Mts., June 1, 1899 (Towns.). Tryon Mt., May 3, 1919 (Day). On Hogback Mt., May 8, 1919 (PT. no. 0203).

390. **Trautvetteria carolinensis** (Walt.) Vahl. (False Bugbane)
Hydrastis carolinensis Walt.
Cimicifuga palmata Michx.

Common on dripping rocks and in deep rich forest soils of mountain glens; a beautiful plant. Specimens: Spring Mt. Pk., July 5, 1897 (Towns.). On dripping rocks, Pearson's Falls, June 27, 1921; on dripping rocks, Hogback Mt., Aug. 14, 1921 (PT. nos. 673–675, 1252, 1257).

Family 41. MAGNOLIACEAE (Magnolia Family)

391. **Magnolia Fraseri** Walt. (Umbrella-tree)

Abundant throughout, but most common in the foothill region. Specimens: Columbus, May 7, 1899 (Towns.). Tryon Mt., April 26, 1911 (Day). Tryon, April 12, 1919; along the lower courses of the

Pacolet, (fruit) Aug. 17, 1921; in rich woods, Vaughan's Gap between Hogback and Rocky Spur, (fruit) Aug. 14, 1921 (PT. nos. 091, 1286, 1210).

Magnolia tripetala L (*M. Umbrella* Desr.), another umbrella tree, is shown by Pinchot and Ashe (Timber Trees of N. C.) as occurring in our area, but has not been found, and it is not in Memminger's list of Henderson County plants.

392. **Magnolia acuminata** (Cucumber Tree. Mountain Magnolia)

Frequent in mountain glens at moderate elevations and in rich soil. Flowers in May. Specimen: "Valhalla," (leaves only) Aug. 25, 1921 (PT. no. 1385).

393. **Magnolia virginiana** L. (Sweet Bay. Laurel Magnolia)
Magnolia glauca L.

The occurrence of this coastal plain small tree or shrub in Polk County must be regarded as distinctly anomalous. As recorded in Pinchot and Ashe (Timber Trees of North Carolina) the nearest station is in Richmond County. The following specimens therefore extend its range over one hundred miles further inland, to within sight of the mountains. It has so far been found in but one locality, in poorly-drained soil, at "The Shoals," (leaves only) Aug. 20, 1921 (PT. nos. 1333, 1334, 1335). The beautiful white fragrant flowers bloom in late April and early May.

394. **Liriodendron Tulipifera** L. (Yellow Poplar. Tulip Tree. White Wood)

This valuable timber tree may be described in our area with three superlatives; our commonest tree; our biggest tree; our most beautiful tree. It is abundant throughout, though most common in the foothills, and most commercially valuable (large sized) in high mountain glens. Blooms from the first week of April to the end of May. Specimen: Tryon, May 20, 1926 (PT. no. 2198).

Family 42. CALYCANTHACEAE (Sweet-Shrub Family)

395. **Calycanthus floridus** L. (Sweet-shrub. Carolina Allspice)
Calycanthus fertilis Walt.

Calycanthus glaucus Willd.
Buettneria florida and *B. fertilis* Kearney

The uniting of the two species, *C. floridus* and *C. fertilis*, has not been suggested before so far as the writer knows and may be regarded as highly unorthodox. Considerable field acquaintaince with the two supposed species, however, has convinced the writer that the diagnostic characters set forth in books, and apparently so distinct, are permutated and interchanged by various individuals. Specimens: Skuyuka Mt., April 15, 1897; side of Tryon range, April 21, 1897; Rocky Spur, April 28, 1897 (Towns.). Tryon, May 1899 (Church.). Tryon, (flowers just past blooming) May 10, 1919 (Day). Tryon, April 9, 1919, April 16, 1922, and May 1926 (PT. nos. 080, 1613, 2132).

396. **Calycanthus nana** (Loisel.) Small. (Sweet Shrub. Carolina Allspice)

Specimen: Ravine near the railroad trestle, Tryon, May 27, 1927 (Wherry).

Family 43. ANONACEAE (Custard-apple Family)

397. **Asimina triloba** Dunal. (Pawpaw)

Common in rich soil, especially of the foothills. Specimens: Spring Mt. Pk., lower Shunkawawkin Falls, April 16, 1897 (Towns.). Tryon, April 16, 1922, April 20, 1923 (PT. nos. 1616, 1865). The leaves are mature in May, the fruits in October and November. Only when fully ripe are the fruits good to eat.

398. **Asimina parviflora** (Michx.) Dunal (Dwarf Pawpaw)
Annona parviflora Michx.

Infrequent and rather inconspicuous. Specimens: Piney Mt., May 8, 1919 (Day). In pine scrub, Marydell, (leaves only) Aug. 31, 1921 (PT. no. 1423). Hyams says the fruit is inedible and poisonous.

Family 44. MENISPERMACEAE (Moonseed Family)

399. **Menispermum canadense** L. (Moonseed)

This curious and beautiful vine, with medicinal-poisonous properties, is found in rich woods frequently. Its fruits, in September, look like

frost-grapes; the flowers, in May, are easily overlooked. Specimens: Tryon, May 1899 (Church.). Saluda, May 1918 (Millsp. no. 4076). In rich woods, "Valhalla," (leaves only) Aug. 25, 1921 (PT. no. 1382).

400. **Coccolus carolinus** (L.) DC.
Menispermum carolinum L.
Cebatha carolina Britton

A river-bank and chiefly piedmont plant, not common. Specimens: below Shunkawawkin Falls, April 17, 1897; "Huston Place," (fruit) July 29, 1897 (Towns.).

Family 45. BERBERIDACEAE (Barberry Family)

401. **Podophyllum peltatum** L. (May-apple. Mandrake)

A familiar drug plant of rich forest soils, especially in the mountains. Specimens: Tryon, May 1918 (Millsp. no. 4029). "Valhalla," April 20, 1922 (PT. no. 1629). Edible fruits ripe in early summer.

402. **Caulophyllum thalictroides** (L.) Michx. (Papoose Root. Blue Cohosh)
Leontice thalictroides L.

Frequent in the Porter soils of mountain forests. Specimens: Pearson's Falls, April 20, 1922, and April 10, 1923 (PT. nos. 1680, 1814).

Family 46. LAURACEAE (Laurel Family)

403. **Sassafras variifolium** (Salisb.) Ktze. (Sassafras)
Laurus Sassafras L.
Laurus variifolium Salisb.
Sassafras officinale Nees & Eberm., not Siebold.
Sassafras Sassafras Karst.

Abundant as a shrub in thickets, by roadsides, as a pioneer in burned-over lands, etc. It also reaches the dimensions of a large tree, and specimens of such are not uncommon in rich woods throughout. Specimens: Side of Tryon range, April 27, 1897 (Towns.). Melrose, April 20, 1922, and April 10, 1923 (PT. nos. 1665, 1816).

404. **Benzoin aestivale** (L.) Nees. (Spice Bush. Benjamin Bush. Wild Allspice. Fever Bush)
Laurus aestivale L.
Lindera Benzoin Blume
Laurus pseudo-benzoin Michx.
Benzoin Benzoin Coulter

Common in thickets and on the edges of woods, especially along foothill streams, with *Alnus*. Specimens: Melrose, April 20, 1922, and April 10, 1923, and March 25, 1919 (PT. nos. 1671, 1817, 029).

405. **Benzoin melissaefolium** (Walt.) Nees. (Spice Bush, etc.)
Laurus melissaefolium Walt.
Lindera melissaefolium Blume

Ashe in private correspondence with the writer reports finding this shrub near Melrose. Though there is no specimen, the report is perfectly reasonable and indeed probable.

Family 47. PAPAVERACEAE (Poppy Family)

406. **Sanguinaria canadensis** L. (Bloodroot)

This famous poisonous-medicinal and dye plant is equally well known as a beautiful spring flower; it is frequent in the Porter soils throughout. Specimens: Side of the Tryon range, Mar. 22, 1897 (Towns.). Woods, "Dark Corners," (large aestival leaves only) Aug. 13, 1921 (PT. no. 1237).

407. **Papaver Rhoeas** L. (Corn Poppy)

Rare, in cultivated fields, introduced from Europe. Specimen: May 23, 1926 (PT. no. 2274).

Family 48. FUMARIACEAE (Bleeding Heart Family)

408. **Dicentra Cucullaria** (L.) Bernh. (Dutchman's Breeches)
Fumaria Cucullaria L.
Cucularia bulbosa Raf.
Bicuculla Cucullaria Millsp.
Cucullaria Cucullaria Farwell

This beautiful little species is found only in the Porter soils of rich mountain woods. Specimens: Pearson's Falls, April 10, 1923 (PT. no. 1840). Pearson's Falls, April 12, 1928 (Kimber).

Family 49. CRUCIFERAE (Mustard Family)

409. **Capsella Bursa pastoris** (L.) Medic. (Shepherd's Purse)
Bursa Bursa pastoris Britton

Common weed in meadows and cultivated ground, of European origin. Specimen: Tryon, May 23, 1926 (PT. no. 2270).

410. **Draba brachycarpa** Nutt.

In open ground. This southern species has just lately been added to the flora. One specimen: Tryon, (in fruit) April 16, 1928 (Day).

411. **Draba caroliniana** Walt.

A little native plant of weed-like habit, lawns, roadsides, and fields. Specimen: Tryon, April 10, 1923 (PT. no. 1836).

412. **Lepidium virginicum** L. (Pepper Grass)

Common native weed of lawns, fields, and roadsides. Specimens: Tryon, May 1918 (Millsp. no. 2214). Tryon, May 23, 1926 (PT. no. 2214).

413. **Thlaspi arvense** L. (Penny Cress)

Infrequent at the present writing. It seems to have just entered our flora. Weed of European origin. Specimen: Tryon, (fruit) May 6, 1926 (PT. no. 2153).

414. **Sisymbrium officinale** (L.) Scop. (Hedge Mustard)
Erysimum officinale L.

In waste ground around the towns, not elsewhere as yet. Weed of European origin. Specimen: Tryon, May 12, 1919 (PT. no. 0129).

415. **Arabidopsis Thaliana** (L.) Britton. (Mouse-ear Cress)
Arabis Thaliana L.
Sisymbrium Thalianum Gay
Stenophragma Thaliana Celak

Frequent as an inconspicuous weed in lawns. European origin. Specimen: Tryon, (fruit) May 5, 1926 (PT. no. 2138).

416. **Radicula Nasturtium aquaticum** (L.) Britten & Rendle (Water Cress)
Sisymbrium Nasturtium aquaticum L.
Roripa Nasturtium Rusby
Nasturtium officinale R. Br.

This valuable European crop plant was introduced into cultivation at "Valhalla" by Dr. Von Kahlden about fifteen years ago. It has now spread down his stream to the Pacolet, and is making headway up other streams, in a weed-like fashion. It will do no harm, however. Specimen: April 26, 1919 (PT. no. 0147).

417. **Roripa palustris** (L.) Bess. (Marsh Cress)
Radicula palustris Moench.
Nasturtium palustre DC.

Rare, in low grounds. Specimen: Roadsides, below Leitner's Hill, June 29, 1921 (PT. no. 755).

418. **Barbarea stricta** Andrz. (Winter Cress)
Campe stricta Wight.

Appearing as if introduced, but probably native at least in closely adjoining regions. Specimen: Springy places along the railroad track, Melrose, April 10, 1923 (PT. no. 1809).

419. **Erysimum cheiranthoides** L. (Treacle mustard)
Cheirinia cheiranthoides Link.

Appearing as if introduced, but if so doubtless native in adjoining regions. Specimen: Railroad embankment, June 4, 1919 (PT. no. 277).

420. **Camelina microcarpa** Andrz. (False flax)

Naturalized from Europe, an infrequent little weed. Specimen: Railroad embankment, Tryon, May 2, 1919 (PT. no. 0192).

421. **Conringia orientalis** (L.) Dumort (Hare's-ear Mustard)
Brassica orientalis L.
Brassica perfoliata Lam.

Adventive from Europe, a frequent little weed. Specimens: Dry earth, "Valhalla," April 19, 1922; railroad track, April 10, 1923 (PT. nos. 1656, 1806).

422. **Sinapis arvensis** L. (Charlock)
Brassica arvensis Ktze.

A European weed, in fields and by roads. Specimen: Nov. 1926 (PT. no. 2396). This is an abnormally late, and probably a second, blooming. Normally blooms in summer.

423. **Brassica nigra** (L.) Koch (Black Mustard)
Sinapis nigra L.

A bad weed of European origin. Specimen: In cultivated fields, Tryon, April 28, 1926 (PT. no. 2124).

424. **Dentaria laciniata** Muhl. (Pepper-root)
D. concatenata Michx.
Cardamine laciniata Wood.

A frequent and characteristic little plant of the Porter soils, especially on mountain slopes. Specimens: Side of Tryon range, March 27, 1897 (Towns.). Pearson's Falls, April 10, 1923 (PT. no. 1820).

425. **Dentaria maxima** Nutt. (Pepper-root)

There seems to have been but a single collection of this species, from the banks of the Pacolet, April 1899 (Towns.). Some authorities interpret this species as a hybrid between *D. diphylla* (not known to be present in our flora) and *D. laciniata*.

426. **Arabis canadensis** L. (Sickle-pod)
A. falcata Michx.
A. mollis Raf.

This rustic salad plant is rather frequent in the mountains, in the Porter soils. Specimens: Spring Mt. Pk., June 10, 1897 (Towns.). Tryon Mt., May 1918 (Millsp. no. 4190). Tryon Mt., June 30, 1921 (PT. no. 804).

427. **Arabis laevigata** (Muhl.) Poir. (Rock Cress)
Turritis laevigata Muhl.

Turritis lyrata Raf.
Arabis pendula Nutt.

In rocky places, occasional. Specimens: Sunset Rock, on Tryon Mt., May 1911 (Day). Lower Shunkawawkin Falls, Tryon Mt., May 3, 1897 (Towns.). "Dark Corners," April 7, 1928 (Kimber).

428. **Arabis dentata** T. & G. (Rock Cress)
Sisymbrium dentatum Torr.
Shortia dentata Raf.

A specimen of this was found in cultivated land. It is probably native in woods, however. Specimen: April 17, 1922 (PT. no. 1627).

429. **Cardamine Clematitis** (Mountain Water Cress)

Frequent in high mountain glens and by springs and streams, in rich shaded soil. Specimens: Pearson's Falls, April 10, 1923 (PT. no. 1822). Melrose, (immature fruit) June 24, 1897, as to right hand specimen (Towns.). Pearson's Falls, April 18, 1919 (Day).

430. **Cardamine rotundifolia** Michx. (Mountain Water Cress)

With the preceding, rarer. Specimens: Melrose, (immature fruit) June 24, 1897, as to left-hand specimen (Towns.). Pearson's Falls, April 20, 1922 (PT. no. 1682).

431. **Cardamine parviflora** L. (Bitter Cress)
Cardamine hirsuta var. *sylvatica* Gray
Cardamine arenicola Britton

Frequent by mountain springs and brooks and on dripping rocks. Townsend's specimen, April 12, 1897, from the Tryon range, has been marked, as to duplicate in National Herbarium, "subsp. *virginica*" in the handwriting of O. E. Schulz (see Schulz: Engl. Bot. Jahrb., vol. 32, p. 484, 1903), and also "specimen optimum" is written in the same hand, in addition to the subspecies name, on Townsend's specimen from the same habitat, May 19, 1897. The present writer does not see the importance of this subspecies. Miss Day's specimen is in fruit, from Tryon Mt., May 9, 1911.

432. **Cardamine pennsylvanica** Muhl. (Bitter Cress)

This is frequent in mountain woods, and by streams. Specimens: Side of Tryon range, May 19, 1897 (Towns.). This is a late blooming date. April is not uncommon.

433. **Cardamine flexuosa** With. (Bitter Cress)

In rich soil, by springs and streams in the mountains. Specimen: April 12, 1928 (Kimber).

Family 50. CRASSULACEAE (Stonecrop Family)

434. **Penthorum sedoides** L. (Ditch Stonecrop)

Townsend's specimen, "wet places, Columbus, July 1897," is the only collection of this somewhat aquatic plant. While widespread on the continent, it is not common in western North Carolina.

435. **Sedum telephioides** Michx. (Stonecrop. Orpine)

This is one of the few plants with a xerophytic habit and habitat found in our area. Confined with us to a few dry cliffs and rocks in the mountains. Specimen: Rocky Spur, Sept. 6, 1923 (PT. nos. 1461, 1462). This is an early blooming date; it is at its height later in the fall.

Family 51. SAXIFRAGACEAE (Saxifrage Family)

436. **Astilbe biternata** (Vent.) Britton (Astilbe. False Goat's Beard)
Spiraea Aruncus var. *hermaphrodita* Michx.

Frequent in rich mountain woods and on dripping rocks. Specimens: Side of Tryon range, June 13, 1899 (Towns.). Tryon, May 1899 (Church.). On dripping rocks, Hogback, (fruit) Sept. 6, 1921 (PT. nos. 1470,A,B,C,D.)

437. **Saxifraga virginiensis** Michx. (Saxifrage)
Micranthes virginiensis Small

Frequent by mountain springs and on dripping rocks. Specimens: Tryon, April 18, 1919 (Day). On dripping rocks, Pearson's Falls, April 20, 1922, April 10, 1923, May 11, 1926 (PT. nos. 1687, 1815, 2164).

A specimen collected from Pearson's Falls by Miss Day in 1911 appears to be intermediate between *S. virginiensis* and *S. micranthidifolia*. Growing in close proximity as they do, it is possible that this is a hybrid.

438. **Saxifraga micranthidifolia** (Haw.) Britton (Saxifrage. Mountain Lettuce)
Saxifraga erosa Pursh.
Micranthes micranthidifolia Small.

This handsome species is said to be eaten by mountaineers, but it is certainly not very tasty. Frequent by mountain springs. Specimens: Melrose, May 1899 (Church.). Tryon, April 1919 (Day). On dripping rocks, Pearson's Falls, April 20, 1922, April 10, 1923 (PT. nos. 1675, 1815).

439. **Saxifraga tennesseensis** Small (Saxifrage)
Micranthes tennesseensis Small

There is a single specimen of this species from our area, collected near Saluda, in the mountains, May 1899, by Judge Churchill. It has not previously been reported from North Carolina.

440. **Saxifraga Michauxii** Britton (Saxifrage)
Saxifraga leucanthemifolia Michx., not La Peyr.
Spatularia leucanthemifolia Haw.
Hexaphoma petiolaris Raf.
Spatularia Michauxii Britton
Spatularia petiolaris Small

On dry rocks of mountain cliffs, frequent, a curious and beautiful species. Specimens: Skuyuka, May 1899 (Church.). Tryon Mt., April 26, 1911; Tryon Mt., April 27, 1928 (Kimber).

441. **Tiarella cordifolia** L. (Foam Flower)

This attractive plant is one of the characteristic species of rocky mountain woods in the glens, beside streams. It also occurs in piedmont glens. Specimens: Tryon, April 10, 1923; Glen Walden, May 1, 1926 (PT. nos. 1862, 2120).

442. **Tiarella macrophylla** Small (Foam Flower)

This endemic species was described from specimens collected on

Tryon Mt. by Huger in May 1896. It is not known to occur elsewhere than at the type locality. The distinguishing features are the glandular-puberulent flowering branches, the big basal glabrous leaves, 12–15 cm. broad, coarsely seven lobed, and the larger, more obtuse carpels.

443. **Heuchera americana** L. (Alum-root. Rock Geranium)

Characteristic of dry cliffs and rocks, especially in the mountains. Specimens: Side of Tryon range, June 4, 1899 (Towns.). Lynn, May 1899 (Church.). Melrose, May 1918 (Millsp. no. 4161). On cliffs, Rocky Spur, Sept. 6, 1921, with *Sedum* (PT. no. 1463).

444. **Heuchera Curtisii** T. & G. (Rock Geranium. Alum-root)
Heuchera lucida Schlect.

This beautiful species with its pink or purple petals has been collected just once in our area. From this state Small in the "North American Flora" cites it only from Buncombe County. Specimen: Ledges above Melrose, May 23, 1899 (Church.).

445. **Heuchera pubescens** Pursh. (Rock Geranium. Alum-root)
Heuchera pulverulenta Raf.
Heuchera reniformis Raf.

A handsome species, found occasionally on dry ledges in the mountains. Specimens: Mountain sides, June 26, 1897 (Towns.). Melrose, May 1899 (Church.).

446. **Heuchera villosa** Michx. (Rock Geranium. Alum-root)
Heuchera caulescens Pursh
Heuchera acerifolia & *H. squamosa* Raf.

Frequent in rocky woods throughout. Specimens: Damp woods, "Dark Corners," Aug. 13, 1921; Pearson's Falls, June 27, 1921 (PT. nos. 1239, 1240, 676, 677). Moist shaded margin of a thicket, Tryon, May 1918 (Millsp. no. 4.55). "Sunset Rock," Tryon Mt., July 27, 1897 (Towns.). Hogback Mt., Sept. 17, 1927 (Wherry).

447. **Chrysosplenium americanum** Schwein. (Golden Saxifrage)
Chrysosplenium oppositifolium Walt.

This is probably frequent on dripping rocks and in cold mountain springs but it has been found only on the dripping rocks at Pearson's

Falls. Specimens: May 17, 1897 (Towns.). May 17, 1926 (PT. no. 2187). May 1899 (Church.).

Family 52. PARNASSIACEAE (Grass-of-Parnassus Family)

448. **Parnassia asarifolia** Vent. (Grass-of-Parnassus)

This is one of the most beautiful of all wildflowers, but is very little known, owing to its habit of blooming in September and October, and its retreating nature. With us it is found chiefly beside or practically in waterfalls in the mountains. Specimen: Shunkawawkin Falls, (not in flower) July 21, 1921 (PT. no. 1005).

Family 53. HYDRANGEACEAE (Hydrangea Family)

449. **Philadelphus grandiflorus** Willd. (Wild Mock Orange. Syringa)

A superb mountain shrub well known to cultivation. Specimens: Skuyuka and Pacolet Gorge, May 25, 1899 (Church.).

450. **Philadelphus hirsutus** Nutt. (Wild Mock Orange. Syringa)

Frequent in rich mountain woods, commoner but less beautiful than the preceding. Specimens: Tryon Mt., May 19, 1897 (Towns.). Tryon Mt., (fruit) June 25, 1897, and White Oak Mt., (fruit) June 25, 1897 (Bilt. Herb. no. 4332C). Tryon Mt., May 11, 1926 (PT. no. 2163).

451. **Deutzia scabra** Thunb.

This handsome oriental shrub is in cultivation and has become well naturalized around Melrose for many years. Specimen: June 27, 1921 (PT. nos. 670, 671, 672).

452. **Hydrangea radiata** Walt. (Wild Hydrangea)
Hydrangea nivea Michx.
Hydrangea discolor Raf.

This beautiful shrub is common on the mountains in deep cool forests and is frequent in glens at lower elevations. Specimens: Alluvial thickets, Tryon, June 20, 1921; Melrose, in deep shade, June 20, 1921; rich woods, "Valhalla," (fruit) Aug. 29, 1921 (PT. nos. 619, 720, 1410).

453. **Hydrangea cinerea** Small. (Wild Hydrangea).

This Georgia and Alabama shrub is rare in North Carolina. House (Woody Plants) records it from Davidson's River. Our area seems to be the only other recorded locality in the state. House says that Small's name is a synonym of *Hydrangea arborescens* var. *kanawhana* Millsp. The North American Flora gives Millspaugh's name as a synonym of *H. arborescens*, however. Specimens: Lynn, June 9, 1897 (Towns.). Tryon, May 12, 1919 (Day).

Family 54. ESCALLONIACEAE (V)

454. **Itea virginica** L. (Virginia Willow)

This pleasing shrub is largely confined to the coastal plain in its natural distribution. It is also cultivated. In our area it seems to occur in just one spot—along Vaughan's Creek near Tryon. Specimens: Near the trestle, May 1899 (Church.). Tryon, May 19, 1919 (Day). Vaughan's Creek, (fruit) June 29, 1921 (PT. nos. 785, 789).

Family 55. HAMAMELIDACEAE (Witch-hazel Family)

455. **Hamamelis virginiana** L. (Witch-hazel)

Hamamelis dioica Walt.
Hamamelis macrophylla Pursh
Hamamelis nigra, aestivalis, rotundifolia Raf.

Common on wooded hillsides and by streams. This well known officinal tree bears the very last blossoms seen in the woods, blooming even after Christmas. Specimens: Dec. 27, 1920, "Glen Walden," Pearson's Falls, (fruit) June 27, 1921 (PT. nos. 1575, 682).

456. **Fothergilla monticola** Ashe.

This splendid shrub is conspicuous where it occurs, but is distinctly local in occurrence, in low thickets. Specimen: Tryon, April 18, 1897 (Towns.). All our specimens when traced down in Small's Flora (ed. 2.) would appear to be *Fothergilla major*, but it seems true, as House states (Woody Plants), that the *Fothergilla major* of Small's Flora is not Loddiges' species.

457. **Liquidambar Styraciflua** L. (Sweet Gum).

This famous and curious tree is very common in our area, though "second growth" or sapling trees appear to be commoner than large trees in our generation. It is not confined, as books state, to swampy woods but also occurs on hillsides and along fencerows and roadways, like the sassafras. Specimen: "Skuyuka Creek, side of Tryon range, April 21, 1897 (Towns.). Tryon, (fruit) Aug. 23, 1921 (PT. no. 1361).

Family 56. PLATANACEAE (Sycamore Family)

458. **Platanus occidentalis** L. (Sycamore. Buttonwood)

This big tree is commonest in the eastern part of the county, along sandy alluvial plains of streams, but it reaches and even penetrates the mountain gorges. Specimen: Along the Pacolet, April 14, 1919 (PT. no. 0102).

Family 57. ROSACEAE (Rose Family)

459. **Physocarpus opulifolius** (L.) Maxim. (Nine-bark)
Opulaster opulifolius Ktze.

There seems to have been but one collection of this in our flora: "Sunset Rock," Tryon Mt., June 10, 1897 (Towns.).

460. **Gillenia trifoliata** (Muhl.) Trel. (Indian Physic. Bowman's Root)
Porteranthus trifoliatus Britton

Common in woods throughout. Specimens: Spring Mt. Park, June 8, 1899 (Towns.). Tryon, May 8, 1911 (Day). Tryon, May 1918 (Millsp. no. 4034). Dry woods, May 6, 1926 (PT. no. 2154).

461. **Aruncus sylvester** Kostel. (Goat's Beard)
Spiraea Aruncus L.
Aruncus Aruncus Karst.

Common in wet rocky soil of the mountains, and on dripping rocks. Specimens: Spring Mt. Pk., May 25, 1899 (Towns.). Melrose, May 1899 (Church.). Melrose, May 1918 (Millsp. no. 4165). On dripping rocks, Pearson's Falls, June 24, 1921 (PT. no. 665, 666).

462. **Pyrus communis** L. (Pear)

Introduced from Europe, cultivated, and sometimes escaped to the edges of woods.

463. **Pyrus coronaria** L. (Crab Apple)
Malus coronaria Mill.

This tree, splendid in flower, is rare with us, but occurs occasionally on sunny slopes of the mountains. Specimen: Near Saluda, Mt. tops, April 1896 (Ashe).

Var. *elongata* (Ashe) Bailey

Specimen: Below Saluda, April 1896 (Ashe).

464. **Pyrus Malus** L. (Apple)
Malus sylvestris Mill.
Malus Malus Britton

Introduced from Europe, cultivated, and commonly escaped to thickets, or spontaneous around old farms.

465. **Pyrus arbutifolia** (L.) L. f. (Chokeberry)
Aronia arbutifolia Pers.
Mespilus arbutifolia L.
Malus arbutifolia var. *erythrocarpa* Michx.

Common shrub of the piedmont, along shady streams. Specimens: Columbus, April 20, 1899 (Towns.). Vaughan's Creek, April 18, 1923, and (fruit) June 29, 1921 (PT. nos. 1853, 735, 736).

466. **Pyrus americana** (Marsh.) DC. (Mountain Ash)
Sorbus americana Marsh.
Sorbus microcarpa Pursh

The presence of this tree in our flora is rather remarkable. In this state it is largely confined to the high mountains, in the Canadian zone. It blooms in spring. Specimen: Shunkawawkin Falls, on Tryon Mt., at 2000 ft., (fruit) July 21, 1921 (PT. nos. 1023, 1024). Our specimens seem to conform to the description of var. *decora* (Schn.) Sarg., described from New York, but possibly this leaf form is too unstable for recognition.

467. **Amelanchier canadensis** (L.) Medic. (Shad. Bush. Shad Blow. Service Berry. Juneberry)
Mespilus canadensis L.
Pyrus Botryapium L. f.
Amelanchier canadensis var. *Botryapium* T. & G.

This pleasing tree is common on hillsides throughout. With us it is generally a goodly sized tree rather than a shrub as in many localities. Locally the name is "Sarviss Tree." Specimen: Spring Mt. Park, March 22 and April 23, 1897 (Towns.).

468. **Amelanchier laevis** Wiegand (Shad Bush. Service Berry)

Townsend's specimen of this plant is the only voucher for what apparently represents an addition to the tree flora of the state—another of Townsend's many remarkable finds. Wiegand in his revision of *Amelanchier* (Rhodora **14**: 154. 1912) does not cite this species south of Pennsylvania, and Coker and Totten (Trees of N. C. 1916) do not include it. The specimen comes from Spring Mt. Park, dated May 29, 1897, probably the flowering date. The specimen also includes mature leaves and nearly mature fruit, making the identity of the plant certain.

469. **Crataegus collina** Chapm. (Hawthorn).

Ashe reports this tree as found by him in Polk County. No specimen seen, but there is nothing inadmissible about the report.

470. **Crataegus Boyntoni** Beadle (Hawthorn)
Crataegus foetida Ashe
Crataegus Buckleyi Ashe

This handsome little tree, blooming in May, is one of our commonest species, on sunny hillsides. Specimens: Tryon, May 15, 1928 (Millsp. no. 4071; called "*C. villipes*"). Mt. Industries, June 4, 1919 (PT. no. 0288). Reported by Ashe from below Saluda.

471. **Crataegus straminea** Beadle (Hawthorn)
Crataegus coccinea var. *viridis* T. & G. in part.
Crataegus coccinea Britton, not L.
Crataegus intricata Sarg., not J. Lange
Crataegus apposita Sarg.

There appears to be only one collection of this species, that of Townsend from the woods of Huston farm, near Columbus. Doubtless it is more widespread in rocky woods of our area. Flowers in May and June. The correct botanical synonym is debatable. Dr. Wiegand, who identified the specimen for me, traced it in Small's "Flora" to the name used above.

472. **Crataegus intricata** Lange (Hawthorn)
Crataegus biltmoreana Beadle
Crataegus coccinea, Eggl. in Gray's Man., not L.

Common in woods. Specimens: Small tree, along shady creek, with fetid flowers. Tryon, May 11, 1926 and (fruit) Aug. 11, 1921 (PT. nos. 2271, 1162, 1163).

473. **Crataegus uniflora** Moench (Hawthorn)
Crataegus tomentosa Eggl. in Gray's Man., not L.
Crataegus parviflora Ait.
Crataegus Vailiae Britton

Perhaps the commonest hawthorn, a shrub frequent on sunny hillsides throughout. Specimens: Fox Mt., near Columbus, May 7, 1897 (Towns.). Tryon, May 7, 1911 (Day). Tryon, April 29, 1919, and on Tryon Pk., June 4, 1919; shady creek, Tryon, May 11, 1926 (PT. nos. 0172, 0321, 2175).

474. **Crataegus aprica** Beadle. (Hawthorn)

A common little tree of sunny hillsides and clearings. Specimens: Tryon, May 10, 1911 (Day). Dry soil, Columbus, (fruit) Aug. 20, 1921 (PT. no. 1327).

475. **Crataegus roanensis** Ashe

Ashe reports this hawthorn from near Saluda. As the author of the species, he was certainly able to recognize it when he saw it, but there are no specimens to confirm it. It has not previously been reported from such a low altitude nor so far east in the state. House (Woody Plants N. C.) states: "chiefly above 4000 ft. altitude on the mountains of the western part of the state and adjacent Tenn."

476. **Crataegus macrosperma** Ashe. (Hawthorn)

Reported by Ashe from mountain tops near Saluda.

477. **Crataegus pruinosa** (Wendle) K. Koch. (Hawthorn)
Crataegus populifolia Ell. not Walt.
Crataegus arcana Beadle

This little tree is common throughout on dry hillsides. The flowers are fetid.

478. **?Crataegus condigna** Beadle (Hawthorn)

This report is based upon specimens from Tryon, Aug. 11, 1921 (PT. nos. 1162–1163). Mr. W. W. Eggleston, one of the monographers of *Crataegus* did not know definitely where to place the species, and the present writer offers this determination as the nearest approximation he can make.

479. **?Crataegus silvicola** Beadle. (Hawthorn)

This is reported by Ashe from Polk County. Its range is ordinarily considered to be Georgia and Alabama but var. *Beckwithae* (Sarg.) Eggleston, ranges to New England. There is nothing really improbable about the report, but there are no specimens to confirm it.

480. **Fragaria virginiana** Duchesne. (Wild Strawberry)
Fragaria vesca Walt., not L.
Fragaria elatior Raf.

Common in fields and woods throughout. Specimens: Tryon, April 3, 1919; Melrose, April 10, 1923 (PT. nos. 060, 1807). Fruit in May and June.

481. **Potentilla canadensis** L. (Cinquefoil)

Common in open soil, light thickets, banks, etc., throughout. Specimens: Tryon, May 1918 (Millsp. no. 4100). Woods, Saluda, May 1897 (Church.). Blooms from April to June, with occasional second bloomings later.

482. **Potentilla pumila** Poir. (Cinquefoil)

In open ground, frequent. Blooms earlier and more briefly than the preceding. Specimen: "The Shoals," May 1918 (Millsp. no. 4100). Tryon, March 18, 1919 (Day).

483. **Geum flavum** (Porter) Bicknell (Avens)

This handsome species seems to have been collected just once: Side of Tryon Mt., June 21, 1899 (Towns.).

484. **Geum canadense** Jacq. (Avens)
Geum carolinianum Walt.

Borders of woods, infrequent. Specimen: Tryon Mt., June 27, 1899 (Towns.).

485. **Geum virginianum** L. (Avens)

This is the only common species, found throughout in woods. Specimens: Pearson's Falls, June 27, 1921; Vaughan's Gap, between Rocky Spur and Hogback, (fruit) Aug. 14, 1921; Pearson's Falls, (fruit) Sept. 2, 1921 (PT. nos. 692, 724, 1264, 1445).

486. **Rubus occidentalis** L. (Black Raspberry. Thimbleberry)

Rare, in sunny mountain thickets. Specimen: Face of Tryon Pk., June 4, 1919 (PT. no. 0301).

487. **Rubus Phoenicolasius** Maxim. (Wineberry)

Introduced from Japan, cultivated, and much naturalized around Tryon. Specimens: May 1918 (Millsp. no. 4189). Thickets, (leaves only) Aug. 27, 1921 (PT. nos. 1407, 1408). Blooms in May, fruits in June.

488. **Rubus allegheniensis** Porter (Blackberry)
Rubus montanus Porter
Rubus nigrobaccus Bailey

Dry open thickets and clearings. Specimen: Tryon, May 1918 (Millsp. no. 4053).

489. **Rubus frondosus** Bigelow (Blackberry)

Frequent in fields and thickets. Specimens: Tryon, May 17, 1919 (Day). Near Bacon's Mill, April 11, 1919 (PT. no. 094).

490. **Rubus canadensis** L. (Blackberry)

In rocky soil, mountains and foothills. The large pink flowers are almost like wild roses. Specimens: Tryon, May 7, 1911 (Day). Pearson's Falls, (leaves) Sept. 3, 1921 (PT. no. 1441).

491. **Rubus cuneifolius** Pursh (Blackberry)
Rubus parviflorus Walt.

Frequent in rocky or sandy soil, fields and thickets. Specimen: Roadsides near "Lyncote," June 4, 1919 (PT. no. 0317).

492. **Rubus Linkianus** Ser. (Blackberry)

A garden plant of unknown origin, probably a garden sport. Cultivated from about 15 years ago on the Leonard property at Tryon and now spreading into adjacent woods and naturalized. Specimen: May 23, 1926 (PT. no. 2210). This seems to be the first record for North Carolina; the specimens were identified by Prof. Rydberg.

493. **Rubus Andrewsianus** Blanchard (Blackberry)

Frequent in fields and along roadsides. Flowers large, rose-like. Specimen: Near Bacon's Mill, April 28, 1919 (PT. no. 0158).

494. **Rubus floridus** Tratt. (Blackberry)

Moist banks, frequent. Specimen: Tryon, May 23, 1926 (PT. no. 2256, A). *Fide* Rydberg.

495. **Rubus alumnus** Bailey (Blackberry)

Woods and fields, common. Specimens, identified by Prof. Rydberg: Dry clay meadow, Tryon, May 20; along shaded creek, Tryon, May 6, 1926 (PT. nos. 2203, A, 2145).

496. **Rubus trivialis** Michx. (Dewberry)

Frequent in fields. Specimen: Tryon, May 1918 (Millsp. no. 4068).

497. **Rubus flagellaris** Willd. (Dewberry)
Rubus villosus Ait., not Thunb.
Rubus procumbens Muhl.

Whether this, the "typical" dewberry, is as common here as the recently segregated species that follow is uncertain, since, when the study

of this flora began, almost all dewberries were called "*R. villosus.*" This species is probably the ancestor of the Lucretia Dewberry, often cultivated. Specimen: Edges of fields, "Valhalla," April 11, 1919 (PT. no. 088).

498. **Rubus Baileyanus** Britton (Dewberry)

Specimen: Along a shaded creek, Tryon, May 11, 1926 (PT. no. 2176). The identify of this specimen was suggested by Prof. Rydberg.

499. **Rubus Enslenii** Tratt. (Dewberry)

Here apparently belongs Miss Day's specimen from Tryon, May 6, 1911.

500. **Agrimonia pubescens** Wallr. (Agrimony)
Agrimonia mollis (T. & G.) Britton

Fields and woods. Specimen: Tryon, July 19, 1921 (PT. no. 981).

501. **Agrimonia microcarpa** Wallr. (Agrimony)
Agrimonia pumila Muhl.

Frequent in fields and woods. Specimens: Columbus, (fruit) Aug. 14, 1899 (Towns.). Open ground, Tryon, Aug. 9, 1921 (PT. no. 1141).

502. **Agrimonia parviflora** Ait. (Agrimony)
Agrimonia Eupatoria Michx.
Agrimonia suaveolens Pursh

Fields and thickets. Specimen: Lynn, (fruit) Aug. 20, 1921 (PT. no. 1302).

503. **Agrimonia rostellata** Wallr. (Agrimony)

In woods. Specimen: Spring Mt. Pk., (fruit) Aug. 9, 1897 (Towns.).

504. **Poterium Sanguisorba** L. (Burnet)
Sanguisorba minor Scop.
Sanguisorba Sanguisorba Britton

Adventive from Eurasia, and naturalized in pastures, "Log Cabin Inn," on White Oak Mt. Specimen: May 14, 1897 (Towns.).

505. **Rosa gallica** L. (Rose)

Introduced from Europe, cultivated, and escaped. Specimen: In Gillette's woods, Tryon, June 21, 1928 (PT.).

The determinations of the species of roses were very kindly made for me by Dr. Eileen Erlanson of the University of Michigan.

506. **Rosa carolina** L. (Rose)
Rosa humilis Marsh.
Rosa caroliniana Michx.
Rosa pratensis Raf.
Rosa virginiana of Britton & Brown, not Mill.

Our most common species, in dry open soil. Specimen: Tryon Mt., June 21, 1928 (PT.).

507. **Rosa Lyoni** Pursh (Rose)

Frequent in dry woods. Specimen: Pettigrew's woods, June 21, 1928 (PT.).

508. **Prunus serotina** Ehrh. (Black Cherry)
Padus serotina Mill.
Cerasus serotina Michx.

Frequent in glens and on slopes throughout. Most of our trees are of small size, and might be mistaken for the shrub, *Prunus virginiana*. Occasionally there is a very large old specimen in the mountains. Specimens: Small tree in a cool glen, Tryon, (fruit) May 23, 1926 (PT. no. 2253). Tryon, April 14, 1928, and Melrose, April 21, 1928 (Kimber).

509. **Prunus virginiana** L. (Choke Cherry)

This shrub is less common than is generally supposed in our area, occurring only in a scattered way along foothill brooks. Specimen: Tryon, April 20, 1923 (PT. no. 1868).

510. **Prunus americana** Marsh. (Wild Plum)

Occasional, in sunny mountain forests and clearings. Specimen: Small tree, Melrose, April 10, 1923 (PT. no. 1819). Fruits from August to October. Perhaps such cultivated varieties as Wild Goose, Wayland and Golden Beauty are hybrids between this and the following species.

511. **Prunus angustifolia** Marsh. (Chickasaw Plum)
Prunus chickasa Michx.

Very common along the sandy banks and flood plains of streams throughout, even in the mountains. Specimens: March 25, 1928, and April 16, 1928 (Kimber). Tryon, April 10, 1923, and Millspring, April 15, 1923 (PT. nos. 1823, 1843). Fruits in early summer. Cultivated descendants are said to be Newman and Lone Star.

512. **Prunus avium** L. (Sweet Cherry)

Noted as an occasional escape from cultivation. Native of Europe. Spring.

513. **Amygdalus persica** L. (Peach)
Prunus persica Stokes

A common escape from cultivation. Native of Asia. Specimen: Melrose, April 10, 1923 (PT. no. 1812).

THE ECOLOGY OF CERTAIN ESTUARINE CRABS AT BEAUFORT, N. C.

By A. S. Pearse

Plate 8

Estuarine animals are of particular interest because they have lost contact more or less with the open ocean. They do not live on exposed wave-beaten shores, but have the protection afforded by the vegetation covering muddy and sandy bottoms. Without the saline, gaseous, and thermal stability which is generally characteristic of waters connected directly with the open sea, they must be able to endure variations in such environmental factors. On shallow, muddy bottoms there is often a lack of oxygen and an abundance of hydrogen sulphide. An estuary is a favorable place to study the migrations of typically marine animals into rivers and through the tidal zone to land. Such migrations have taken place many times during the past and are progressing in many parts of the earth at the present time.

The Biological Station of the United States Bureau of Fisheries at Beaufort, N. C., is well situated for the study of migrations of this sort. It is on an island, adjacent to two sounds and the mouths of two rivers. The writer was fortunate in being able to work at this station from August 22 to September 6, 1928, and is indebted to the director, Dr. S. F. Hildebrand, for many courtesies. Water temperatures at the station pier ranged from 21.6°C. to 35.0°C. and salinities between about 36.0 and 37.0 grams per liter; but in the spring salinities at the same station were as low as 27 grams and temperatures during the previous winter reached 1° to 3°C.

In order to test the ability of typical decapods to live in diluted sea water ten species of crabs were selected for study. Representatives of these were collected and brought into the laboratory as soon as possible. They were placed in clean glass dishes which were appropriate to their size and which held from 100 to 4000 cc. of water from storage tanks. Clean water was put in the dishes at least once during every twenty-four hours and none of the crabs were fed. To test the ability of the same species of crabs to endure desiccation they were placed in similar con-

tainers in which there was nothing but air or which were partly filled with clean, dry sand. The species studied were as follows:

Callinectes sapidus Rathbun, a large portunid crab which is widely distributed in littoral habitats and even invades fresh water, where it is found associated with a crayfish, *Cambarus blandingii* (Harlan), and the pumpkinseed, *Eupomotis gibbosus* (Linnaeus).

Libinia dubia H. Milne-Edwards, the common spider crab on flats among vegetation.

Menippe mercenaria (Say), the stone crab, is the largest crab in the Beaufort region. It lives in burrows just below low tide mark along shoals.

Panopeus herbstii H. Milne-Edwards, the mud crab, is "found wherever the bottom in shallow water is muddy or covered with shells or stones. In suitable localities, along the edges of the higher marshes, it is often found in burrows and frequently associated with *Sesarma reticulata* and *Uca minax*" (Hay and Shore, 1918).

Eurypanopeus depressus A. Milne-Edwards, the flat mud crab, "appears to frequent localities where the water is comparatively clean and is not often found where the other mud crabs abound."

Uca minax (Le Conte), the largest fiddler about Beaufort, usually lives in marshes at some distance from open salt water.

Uca pugnax (Smith) burrows between tides in mud in marshes.

Uca pugilator (Bosc), the little sand fiddler, digs burrows near and above high tide mark.

Sesarma cinerea Say lives alongshore, usually at high tide mark where there is accumulated flotsam.

Ocypode albicans (Bosc), the ghost crab, is associated with sand and digs burrows from high tide mark to some distance inland.

The crabs which are able to live best in fresh water are not the largest (*Ocypode*, 6 hrs.; *Callinectes*, 3), but the flotsam frequenter (*Sesarma*, 40) and the fiddlers (48, 18.7, 11). The mud crabs survive only a few hours (5) and the spider crab (Libinia, 0.25) only a few minutes. All species, except *Ocypode albicans*, lived for considerable periods of time in varying dilutions of sea water. In air *Ocypode* lives longest (52.7 hrs.) and the others survive in the following order: *Uca minax* (48), *Callinectes* (36), *Eurypanopeus* (25), *Sesarma* (23), *Uca pugnax* (16), *U. pugilator* (12), *Panopeus* (9), and *Libinia* (8).

In general the species which show the greatest ability to live in air also show similar ability to live in diluted sea water or in fresh water. Probably the large crab, *Callinectes*, lives for a considerably longer time

in air than in fresh water on account of its size. With the exception of the little crabs, *Sesarma* and *Uca pugilator*, all the crabs tested lived longer in air than in fresh water. This probably means that it takes

TABLE I

LENGTH OF LIFE IN HOURS OF VARIOUS CRABS IN SEA WATER, FRESH WATER, DILUTED SEA WATER, AIR, AND ON DRY SAND

The first number shows the average and the second the maximum number of hours. ± means that a crab was alive at the end of the observations.

SPECIES	NUMBER TESTED	SEA WATER	¾ SEA WATER	½ SEA WATER	¼ SEA WATER	FRESH WATER	AIR	SAND
Callinectes sapidus	14	144+	144+	144+	14.5	3	28.5	36
		144+	144+	144+	24.0	3	36	40
Libinia dubia	9	120+	120+	120+	0.4	0.25	8	8
					0.5	0.25		
Panopeus herbstii	13	168+	168+	168+	97+	4	9	17
		168+	168+	168+	168+	5	9	17
Eurypanopeus depressus	14	168+	166+	168+	168+	4	22.3	9
		168+	168+	168+	168+	5	25.0	9
Uca minax	14	240+	240+	154+	240+	37	36	21
		240+	240+	240+	240+	48	48	24
Uca pugnax	14	240+	240+	240+	240+	11	13	10
		240+	240+	240+	240+	11	16	10
Uca pugilator	17	240+	240+	240+	240+	18.3	9.7	9.3
		240+	240+	240+	240+	18.7	12.0	12.0
Sesarma cinereum	14	120+	120+	120+	68+	27.2	18.7	19.7
		120+	120+	120+	120+	40.0	23	25
Ocypode albicans	14	4	10	7	4	5	45.3	31
		4	14	8	4	6	52.7	35

longer in air to lose enough water to die than it does in fresh water to lose enough essential body salts to cause death.

The ability to resist loss of body water or body salts depends on the external membranes. If these are able to resist changes in the body fluids, they appear also to have some degree of ability to resist loss of

water in air. Many crabs appear to be more or less euryhaline and their blood normally contains a little less salt than the surrounding medium (Duval, 1924). However, *Ocypode*, though it lives at times in fresh water does not live long after sudden transfer from sea water (table I), but the same individuals would probably be able to survive a gradual decrease in salinity.

As crabs, and other animals, migrate from the ocean to land they must abandon gill-breathing, probably because gill membranes allow water to escape too readily, and more and more turn to respiration through moist membranes on the surface of the body or within cavities

TABLE II

SHOWING NUMBER OF GILLS AND VOLUME OF BODY IN RELATION TO VOLUME OF GILLS IN CERTAIN CRABS, AND THE HABITATS OF SUCH CRABS

SPECIES	NUMBER OF GILLS	VOLUME OF BODY	HABITAT
Callinectes sapidus	16	22.7	Pelagic; littoral; fresh water
Libinia dubia	18	27.6	Below low tide mark
Menippe mercenaria	18	33.7	Below low tide mark
Panopeus herbstii	18	35.8	Tidal zone and below
Eurypanopeus depressus	18	36.0	Tidal zone and below
Uca minax	12	♂ 45.9 ♀ 34.1	High tide mark; not near ocean; fresh water
Uca pugnax	12	♂ 57.1 ♀ 35.3	Tidal zone; muddy marshes
Uca pugilator	12	♂ 60.3 ♀ 38.0	Near high tide mark; sand
Sesarma cinereum	16	63.3	Flotsam at high tide mark
Ocypode albicans	12	67.4	Sand; between and above tidal zone

which serve as lungs. In order to ascertain the condition of the gills in the types of crabs selected for study a dissection of each species was made (pl. 8) and the volume of the gills in relation to the volume of the body was determined. In order to measure volumes crabs were hardened 24 hours in 1 per cent chromic acid and rinsed in water; the legs were then removed, the carapace was lifted off from the body, and the gills were cut free from their attachments. All parts were placed on blotting paper and allowed to drain; the gills were then dropped into one graduate and the remaining body parts into another.

As crabs become adjusted to life on land there is a gradual reduction in the number and volume of the gills (pl. 8; table II). There are no

apparent structural adjustments among the crabs which have migrated into fresh water. *Callinectes sapidus* Rathbun, and *Callinectes ornatus* Ordway (Brues, 1927) live in perfectly fresh water, but have sixteen gills, as all portunids do, even those which spend their lives in the Saragassum and perhaps never approach the shore.

In his admirable paper on the origin of land animals Barrell (1916) says, "the rarity of the passage of crustaceans, gastropods, and vertebrates from a truly marine to a truly terrestrial mode of life through the apparently open path of the tidal zone adds to the evidence that an unused food supply could not alone operate as a cause sufficient to induce this change, for so far as this factor is concerned the river faunas would have no clear advantage over those in the tidal zone." Doubtless an unused food supply did not alone cause animals to leave the ocean and migrate to the land. There were other factors, such as predaceous enemies and perhaps lack of oxygen. Barrell is without doubt right in his assertion that land vertebrates came from fresh water, but the writer does not believe he is correct in saying that the gradual migration of crustaceans and gastropods from ocean directly to land is or has been rare.

Among the crabs discussed in this paper there is a gradual transition from those which live wholly in the ocean to those which live largely on land. *Libinia* and *Menippe* are found only in the ocean. The latter, which is a burrower and thus has an opportunity to conserve moisture, never ascends above low tide mark and is large, powerful, and sluggish. *Callinectes* is very active and has successfully invaded fresh water, but its paddle-like fifth legs and other structural features have committed it too strongly to aquatic life to permit it to go on land. When the tide ebbs it may be left between tides, but it quickly crawls into some crevice or wiggles down into the sand. The other crabs studied carry on activities in the air and some of them are land animals. All of them are lurkers under littoral debris or burrowers. *Eurypanopeus*, *Panopeus*, and *Uca pugnax* live largely in the intertidal zone. *Uca minax*, *U. pugilator*, *Sesarma*, and *Ocypode* live near high tide mark or above. The two latter, and indeed to some extent the two former, have one of the characteristics of land animals—speed (Jehu, 1923).

Animals which attain life on land must be able to conserve water and endure great variations in temperature. In the ocean the arthropods and gastropods already had exoskeletons which prevented loss of water and the vertebrates had flexible skins which served the same purpose. The problem for such animals was and is largely in becoming able to

breathe air through moist membranes without losing too much water. The fishes reached land largely through fresh water swamps but many crustaceans and gastropods have migrated and are migrating landward through the tidal zone. In estuaries habits of burrowing or lurking in crevices help in enabling animals to survive when exposed at low tide. Such extracorporeal protection as is furnished by a burrow or a crevice helps conserve moisture. When placed in dry sand *Callinectes* lives a little longer than in air (table I), probably because it is large enough so that its body can lose some water, which moistens the surrounding sand and thus forms a protective cocoon. *Eurypanopeus*, on the other hand, is so small that in dry sand loss of moisture is soon fatal.

A land animal at its best is not only an eurythermal, water-conserving pulmonate, but also swift and sharp visioned. The reward for animals which struggle from the ocean to land is the ability to live at a high level; i.e. to live rapidly. The high percentage of oxygen in the atmosphere permits rapid metabolism continuously. The rarity of the atmosphere as a medium permits rapid movement, and swift locomotion is associated with visual acuity. *Ocypode* is most truly a land crab among those considered. Its gills are reduced in number and small in size; and breathing takes place to a considerable extent through vascular tufts which project from the lining of the branchial cavity (Pearse, 1929). It is swift and sure in its movements. It digs burrows at considerable distances from the ocean and can live only a short time under water. *Sesarma* hugs the shore and may live for considerable periods of time under water. It is very swift. Its gills are little reduced in number but are small in volume. It has no respiratory tufts. The three species of fiddlers (*Uca*) have a small number of gills, but when in the air carry water in their branchial cavities and cannot leave the margins of aquatic habitats.

Now, a final word as to the reasons why crabs migrate from ocean to land. Some apparently fear what the ocean holds—the fiddlers plug up their burrows before the rising tide covers them (Pearse, 1914); *Ocypode* runs into the ocean at times to escape enemies but never stays long and never enters the ocean to feed (Cowles, 1908). There may be a dearth of oxygen, especially among plants on the muddy bottoms of marshes. There may be "lures," such as the food along the drift line, and there may be other factors. One which has been little discussed and which is perhaps most important of all is the tendency of species to segregate into a particular habitat where each competes with other species as little as possible. There is probably no conscious selection by crabs

with reference to competition for habitats. A crab frequents a particular place because it can find a living and is in least danger.

The fiddler crabs belonging to the genus *Uca* are quite similar in general structure, but show quite specific differences in choices of habitats, and some degree of difference in their resistance to fresh water and to desiccation. Their life histories have not been modified as yet and all three species hatch from the egg in about the same stage (Hyman, 1920). In this they are less progressive than the littoral snails studied by Colgan (1910). They have probably not been segregated into habitats as long as the snails.

SUMMARY

1. Ten species of crabs from different habitats at Beaufort, N. C., were studied for evidences and methods of, and reasons for, migrations from sea to land and fresh water.

2. All the crabs studied, except *Ocypode*, lived for considerable periods in various dilutions of sea water.

3. *Ocypode* lived longer in air than other crabs, but fiddlers and *Sesarma* showed considerable resistance to desiccation. Most crabs lived longer in air than in fresh water.

4. The crabs at Beaufort seem more often to show adaptations which indicate past migration directly to land through the tidal zone than those to land through fresh water.

5. In general the number and volume of gills is reduced as crabs migrate from the ocean to land. *Ocypode* has also developed respiratory tufts from the lining of the gill cavity.

6. While danger, food, oxygen, and other factors may have been potent in causing animals to move from the sea to land and fresh water, perhaps the most important factor has been the tendency for all species to segregate into particular habitats in order to avoid competition.

BIBLIOGRAPHY

BARRELL, J. Influence of climates on vertebrates. Bull. Geol. Soc. Amer. **27**: 40–41, 387–436. 1916.

COLGAN, N. Irish Nat., 1910.

COWLES, R. P. Habits, reactions, and associations in *Ocypoda arenaria*. Pap. Tortugas Sta. Carnegie Inst. Wash. **2**: 1–41. 1908.

DUVAL, M. Recherches sur le miiieu intérieur des Invertebrés marins. Comparison entre le en choloure de sodium de ce milieu et celle de l'eau de mere extérieure. Bull. Sta. biol. Archachion **21**: 33–39. 1924.

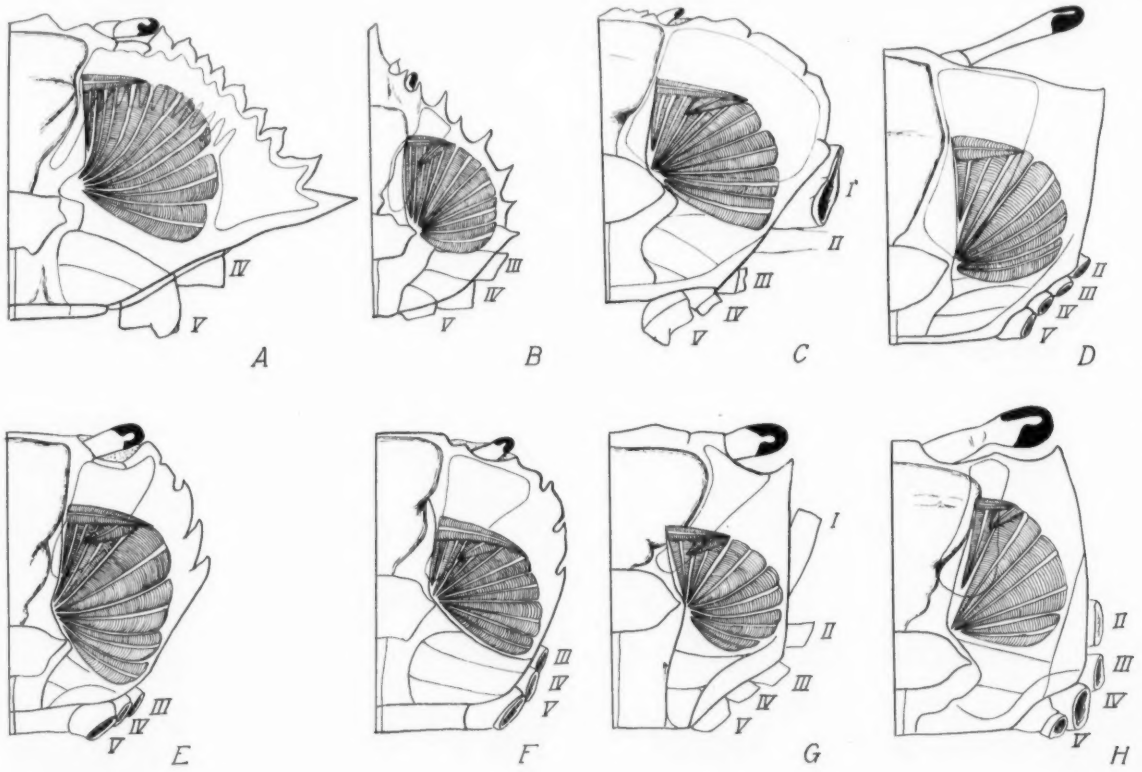


PLATE 8

Bodies of Beaufort crabs showing gills: *A, Callinectes sapidus; B, Libinia dubia; C, Menippe mercenaria; D, Uca pugilator; E, Panopeus herbstii; F, Eurypanopeus depressus; G, Sesarma cinereum; H, Ocypode albicans.*

HAY, W. P., AND C. A. SHORE. The decapod crustaceans of Beaufort, N. C., and the surrounding region. Bull. U. S. Bur. Fisheries **35**: 371–475. 1918.

HYMAN, O. W. The development of Gelasimus after hatching. J. Morphol. **33**: 485–501. 1920.

JEHU, T. J. The origin of terrestrial vertebrates. T. Edinb. Geol. Soc. **11**: 251–252. 1923.

PEARSE, A. S. Habits of fiddler crabs. Smithsonian R. (1913): 415–428. 1914.

PEARSE, A. S. An account of the Crustacea collected by the Walker expedition to Santa Marta, Colombia. P. U. S. Nat. Mus. **49**: 531–556. 1914.

PEARSE, A. S. The migration of animals from the ocean into freshwater and land habitats. Amer. Nat. **61**: 466–476. 1927.

PEARSE, A. S. Observations on certain littoral and terrestrial animals at Tortugas, Florida, with special reference to migrations from marine to terrestrial habitats. Pap. Tortugas Sta. Carnegie Inst. Wash. 1929.

DUKE UNIVERSITY,
DURHAM, N. C.

A NEW PYXIE FROM NORTH CAROLINA

By B. W. Wells

Plate 9

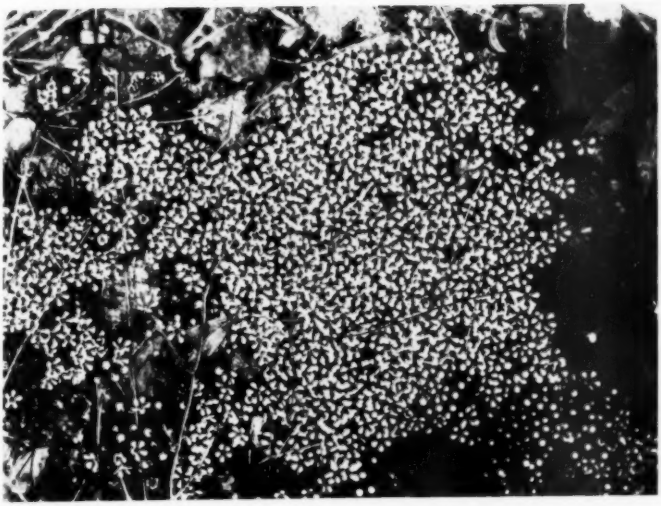
While prosecuting some ecological studies in the sand hills of southern Harnett County, N. C., during the summer of 1927, the writer discovered a curious mat plant having the aspect of a thick-leaved xeric moss. It was seen in but one locality where it was very abundant. The following spring (1928), during the latter half of March, the plants were obtained in flower, and proved to be a pyxie species very distinct from *Pyxidanthera barbulata* Michx.

Pyxidanthera brevifolia sp. nov. Depressed, much-branched, the short branches creeping or mostly stolon-like, the plants thus forming very compact mats, 1–6 dm. in diameter and closely simulating moss: leaves 1–5 mm. long (mostly 1–2 mm.), densely crowded, the blades subulate, red or green, lanate, sessile: bracts of the involucre not over 2 mm. long, commonly red-tinted, copiously lanate: flowers about 7 mm. broad, numerous: sepals free, oblong, 3–3.5 mm. long, obtuse, ciliate, rose-colored; corolla rotate, white; tube campanulate, lobes broadly spatulate, cuneate or cuneate-obovate, as long as the tube; capsule globose, about 2 mm. diameter.

On dry sand hills, Harnett Co., N. C. Spring. Small leaved pyxie or flowering moss.

From the above it is noted that the short stolons and stems with their very short thick leaves (mostly 1–2 mm. long) indicate xeric specialization, which is in entire harmony with the habitat, for this species occupies a somewhat drier sandy soil than that on which the other well known form occurs. *P. brevifolia* is associated with a community characterized by the presence of *Gaylussacia dumosa*, rather sparse growth of *Aristida stricta*, *Quercus Catesbaei*, *Stillingia sylvatica*, *Carduus repandus*, and *Dicranium spurium* under the oaks. In the succession on the coarse sand areas, this community immediately follows the pioneer stage.

PLATE 9



Pyxidanthera brevifolia in early spring, showing characteristic massing of flowers

The writer wishes to express his thanks to Dr. J. K. Small, of the New York Botanical Garden, for confirmation of the species as new, and some suggestions in connection with the description.

STATE COLLEGE,
RALEIGH, N. C.

SOME RARE OR NEW PROTOZOA

By BERT CUNNINGHAM

At the annual meeting of the North Carolina Academy of Science in 1922,[1] the writer presented a preliminary list of the more common protozoa taken in Durham County, N. C.

The three forms here figured were presented at that time with the notation that they were either new or rare. Constant examination of the literature of protozoa since that time has not revealed any existing genera to which these may be assigned. Since these figures have not been published before, it is thought best to present them now with descriptions of the forms without an effort to name them at present. Unfortunately they have not been taken since the original observation, hence the descriptions and figures are not all that might be desired.

They are apparently all Infusoria although in none of the three were cilia positively proved to be present by staining. The locomotion of all three was typically Infusorian.

The body of the first (see figure 1) is shaped like a dirigible balloon. There is on the anterior end a sort of hood which extends down over the sides and in front of the mouth. The number and type of nuclei were not determined. The accompanying figure is from a clay model fashioned after a camera lucida drawing.

Size—Length about 150 μ, width about 40 μ.

Locomotion—Cilia, if present, are very fine, but locomotion is typically that of a ciliate.

Habitat—Found in old hay infusions.

The second specimen (figure 2) has a flattened ovoid body with a shelf-like projection extending nearly around the body. The figure represents an aboral view. Neither cilia nor flagella were observed. Locomotion was typically ciliate.

Size—Length 125 μ, extreme width 60 μ, thickness about 30 μ, width of shelf about 10 μ.

The body of the third (figure 3) is oval with an perioral membrane which has exceedingly large cirri. The groove formed by the membrane is a very slight ~ shape. The figure illustrates the side view.

[1] Jour. Elisha Mitchell Sci. Soc. **38**: 9.

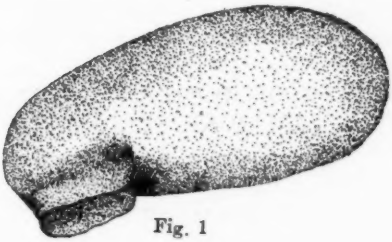


Fig. 1

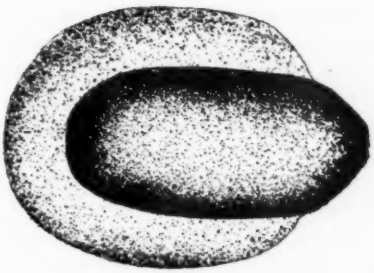


Fig. 2

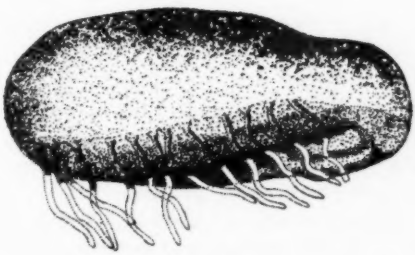


Fig. 3

Size—Length about 150 μ, width about 100 μ, thickness about 30 μ.
Locomotion—Typically ciliate.
Nucleus undetermined.
Habitat—Found in old hay infusions.
The writer would appreciate any aid in determining the position of any of these forms.

DUKE UNIVERSITY,
DURHAM, N. C.

A MONOGRAPH OF SEPTOBASIDIUM.—PART I. JAMAICAN SPECIES[1]

By J. N. Couch

Plates 10–25

The material on which the following descriptions of species are based was collected in the Blue Mountain regions of Jamaica, B. W. I., during the summer of 1926. Detailed notes and a good many of the drawings were made in Jamaica while the plants were in the fresh condition. That the writer was able to do this in Jamaica is due to the genius of Dr. Duncan S. Johnson, of Johns Hopkins University, who transformed an old abandoned coffee factory into a well appointed laboratory.

The species have been compared with the collections of *Septobasidium* in the Missouri Botanical Garden Herbarium, in Dr. E. A. Burt's Herbarium, and in the New York Botanical Garden Herbarium. I am particularly indebted to Dr. Burt for identifying the species of *S. jamaicaense* Burt and *S. frustulosum* (B. & C.) Pat. I should also like to acknowledge my gratitude to Dr. W. C. Coker for encouragement and advice.

It is the purpose of the present article to give a summary of the results of my observations on the biology of the genus and to describe the species collected in Jamaica. In a subsequent article other species are to be described and a detailed account of the biology of certain species is to be presented.

Species of *Septobasidium* inhabit the bark and leaves of living trees, shrubs and sometimes herbaceous plants. Von Höhnel (1907) first discovered scale insects beneath the stroma of *Septobasidium* and, finding that the fungus did not penetrate into the tissue of the leaf, concluded that a close biological relationship must exist between the fungus and the scale insects. Regarding the nature of this relationship, he states, "It may be parasitism, or saprophytism, or it may be that a complicated symbiotic relationship exists."

Since his remarkable discovery, the majority of species described

[1] A large part of the work reported in this paper was done while the writer was a National Research Council Fellow in Botany at the Missouri Botanical Garden.

have been found associated with colonies of scale insects, and interest has been directed to the relationship between the fungus and the scale insects. One group of investigators claims that the fungus parasitizes the bodies of the insects, completely overgrowing and finally destroying them (Petch, 1911, 1921, 1927; Burt, 1916; Snell, 1922). Another group claims that the species of *Septobasidium* live saprophytically or epiphytically on the excretions of scale insects (Gäumann, 1926).

As a result of continuous studies for the past two years on several common species around Chapel Hill and studies on the Jamaican material preserved in formol-acetic alcohol, I have found that neither parasitism nor saprophytism adequately describes the relation between *Septobasidium* and the scale insects, but rather that a symbiotic relationship exists. I shall give here merely a summary of the more important results obtained on one species.

In the case of *S. retiforme* (B. & C.) Pat., an exceedingly common species on a great variety of trees and shrubs in the southeastern United States, it has been found that the fungus and scale insects live together in a symbiotic relationship at the expense of the host plant. This fungus-insect relationship is perennial, depending only upon the life of the tree or shrub. The fungus furnishes a home and protection for the insects, so that, shielded from inclement weather and protected from their natural enemies, the insects may suck the juices of the host plant, grow and finally reproduce their young in vast numbers. These young, depending upon the time of year, crawl out toward the margin of the fungus, settle down and some of them repeat the cycle; others are parasitized by the fungus.

The type of parasitism is of a highly specialized nature. The fungus enters the circulatory system of the living insect and there develops numerous exceedingly elaborate coils which absorb food from the "blood" of the insect. A number of insects are finally killed and used up by the fungus, others though infected may survive to reproduce, and some are free from any infection. The fungus also receives some nourishment from the excretions given off by the healthy, uninfected insects; but this amount of food is negligible as compared with that derived from the parasitized insects.

In all other species studied, save the one herein-after reported parasitic on the sporangia of a fern, essentially the same relation exists between the fungus and scale insects as has been found in *S. retiforme*. On plate 24 are shown the several types of haustoria which the various species here described develop in the circulatory systems of the parasitized insects.

In *S. retiforme* the fungus never seems to penetrate into the bark. Evidence for the truth of this statement can be beautifully demonstrated by thoroughly wetting a piece of limb on which the fungus is growing and it is then possible to lift the entire fungus from the bark except where it is indirectly fastened to it through the parasitized scale insects. This is not true for all species of *Septobasidium*. Several species from Jamaica, as described below, do penetrate into the bark, in some species, reaching the living cells. Such species are, however, at the same time symbiotically associated with scale insects. Some species have been reported as destroying the scale insects and then parasitizing the plant (Petch, 1921). "That happens," quoting from Petch, "in the case of an undetermined species on tea in Ceylon, the species which causes the disease known as velvet blight on tea in northern India, and several species on tea and mulberry in Japan."

Owing to the large number and great variety of species which have been described and the fact that in a number of these species the basidia, and in some cases, the probasidia, have not been seen, it is impossible to give a satisfactory comparative discussion of the genus as a whole. It is also quite difficult to satisfactorily separate the genus *Septobasidium* from *Helicobasidium* as indicated by the confusion which has arisen over *Helicobasidium Mompa* Tanaka. It seems best, for the present at least, to follow Patouillard (1900) and have the presence of the probasidial cell in *Septobasidium* and its absence in *Helicobasidium* the chief distinguishing character between the two genera.

A description of the genus follows:

SEPTOBASIDIUM Pat.

Plant body usually resupinate but very variable, dry, crustaceous or spongy. In the commoner species composed of three regions: the subiculum which grows over the bark, the middle region composed of upright slender pillars or thick pillars or mounds or ridges of hyphae which support the top layer in which the hymenium is formed. In some species the context is more or less compact throughout. Threads septate, without clamp connections. Probasidial cell undergoing a long period of rest before germinating, or elongating immediately into the basidium. Basidium usually transversely septate into two or four cells, rarely one-celled, straight or curved. Spores elliptic or bent-elliptic, colorless, becoming divided into two to eight cells soon after formation and budding numerous sporidia if kept moist. Inhabiting the stems, branches or leaves of living woody plants and generally symbiotically associated with scale insects, some of which are parasitized, others of which are left to reproduce; but sometimes directly parasitic on plants.

Widely distributed in the tropics and the warmer regions of the temperate zone.

Patouillard in 1907 described a very peculiar species under the name of *Septobasidium* (*Noackia* nov. subgen.) *scopiforme* nov. spec. This species differed from all others in that instead of having a resupinate structure as a *Corticium* it was composed of a tuft of upright branches in the manner of a *Clavaria* or a *Lachnocladium*. In probasidial and basidial characters the plant resembled *Septobasidium;* and, therefore, in spite of the peculiarity of vegetative structure it was given only subgeneric rank.

Raciborski (1909) studied eight different species of *Septobasidium* and as a result of his studies divided the genus into three genera or subgenera on the ground of the morphological structure of the vegetative body. These groups are: *Ordonia*, in which the vegetative body, as in *Tomentella*, consists of a fine, web-like, undifferentiated layer; *Mohortia*, in which the plant body is composed of two layers, a basal sterile layer over which is formed the hymenial layer; and *Septobasidium* in which, between the basal layer and the top hymenial layer, there is still another region, the middle region, composed of pillars which support the hymenial layer (1. c., p. 360).

It would seem that these three subdivisions, while suggestive, do not help much in arriving at a natural grouping of the various species of *Septobasidium* since they do not take into account the probasidial or basidial characters. In the writer's opinion, they should be recognized as subgenera rather than as genera, as was done by Patouillard with *S. scopiforme*. In attempting to use only the vegetative characters of *Septobasidium* as a basis for generic classification one comes upon an exceedingly peculiar condition. In all the species which the writer has examined, except the species parasitic on fern sporophylls, the fungus is symbiotically associated with scale insects. This association, in some species, is coincident with a high degree of modification in the vegetative structure of the fungus. These sub-hymenial characters are very helpful in separating species, but it would seem hardly logical to split the genus up into several genera on the basis of these vegetative modifications when the probasidia and basidia show such variable peculiarities in development and structure. It would seem much better to follow the line of division established by Patouillard (1892) if the genus must be split.

Patouillard (1892) divided the genus into two groups on the basis of

the development and structure of the probasidium and basidium as follows:

A. Typicae: Entire probasidium elongating to form the basidium. E.g., *S. Michelianum* (Ces.) Pat. and others cited by Patouillard.

B. Gausapia: Probasidium persistent in the form of a globose sac with thickened walls. E.g., *S. pedicellatum* (Schw.) Pat.; *S. Langloisii* Pat.

Patouillard further stated that the basidia might be once to thrice septate.

Key to the Jamaican Species

A. Entire probasidium elongating to form the basidium
  1. Basidium 2-celled
    a. Middle layer composed of abundant, distinct, tall (up to 2 mm.), slender pillars.....*S. jamaicaense* Burt
    b. Middle layer composed of anastomosing ridges of hyphae; context areolate.....*S. areolatum* n. sp.
  2. Basidium 4-celled
    a. Middle layer composed of erect pillars; hymenium thin, papery *S. papyraceum* n. sp.
    b. Middle layer composed of exceedingly broad anastomosing ridges of hyphae; hymenium with dichotomously branched and coiled hyphae.....*S. frustulosum* (Berk. & Curtis) Pat.

B. Probasidium persisting in the form of a globose or subglobose sac
  1. Basidium 4-celled
    a. Middle layer composed of pillars which are very short; hymenial layer with numerous small black dots.....*S. atropunctum* n. sp.
    b. Middle layer irregularly honey-comb like, alveolate *S. alveolatum* n. sp.
    c. Middle layer compact; on fern sori.....*S. Polypodii* n. sp.
  2. Basidium one-celled, bearing one spore *Septobasidium* (*Unisporum* n. subgen.) *purpureum* n. sp.

Septobasidium jamaicaense Burt

Plates 11, 15, 16, 23, 24

Plant body resupinate, often stratose, often covering an area of several square decimeters on the bark of living trees; up to 1 cm. thick in large fresh specimens, drying down to 2–4 mm. thick. Plants usually consist of two distinct regions: the very thin, byssoid, marginal, vegetative region and the thick, fruiting region. Marginal region up to 3 cm. wide, composed of numerous blackish brown rhizomorphs with a purplish tint, from which branch out a delicate sheen of mycelial threads; rhizomorphs and threads closely adherent to the bark, but separable from it when wet. Fruiting region smoke gray or pale neutral gray over a

bister or bone brown context. In section composed of three layers: (1) the subiculum, which runs horizontally over the bark, and is composed of numerous very conspicuous rhizomorphs and mycelial threads, 100–300μ thick and from which the pillars arise in vast numbers; (2) pillars nearly straight and perpendicular in the growing region of young plants but becoming considerably entangled, passing obliquely from the subiculum to the hymenium, sometimes branched, very variable in diameter, sometimes composed of as few as three threads and then about 6.2μ thick, often up to 60μ thick, rarely up to as much as 180μ, most 20–30μ thick; single pillars very long, often 2 cm.; threads of pillars about 3.7μ thick, rarely branched, septate without clamp connections; pillars branching and then the branches breaking up into single hyphae as the pillars approach the hymenium; (3) hymenium compact in certain areas, hypochnoid in others, showing clusters of the spore-bearing organs, 70–100μ thick, composed of probasidia borne laterally in various stages of development; subglobose, varying in size from the youngest initial bud up to the fully mature basidium, 8–14 $\times$ 40–62μ, straight, once septate, a transverse partition thus giving the "basidium" the appearance of a teleutospore of *Gymnosporangium macropus*, each cell sprouting a long sterigma on the end of which is borne a long spore which is more or less pointed at both ends and distinctly recurved at the distal end; spores white, 6.8–11 $\times$ 23–39μ, including the bent end, most about 8 $\times$ 27μ; usually becoming thrice septate and not rarely seven times septate; often forming, after the septation process is complete, numerous little spores by a budding process.

Associated with colonies of scale insects, some of which are parasitized by much gnarled, irregular coils of hyphae, others of which are not parasitized (plate 24, fig. 6). Scale insects very abundant and evidently the primary direct source of injury to the trees. On *Solanum punctulatum*, Jamaica, B.W.I.

This species has apparently been collected only once before and was then found in Jamaica in the Blue Mountain region, "John Crow Peak," at an altitude of 5500 feet, in April by Dr. L. M. Underwood. It was first described by Dr. E. A. Burt ('16) from Underwood's material and was very appropriately named *S. jamaicaense* since I have later found this species to be by far the commonest in Jamaica. My material has been seen by Dr. Burt and has been compared with his type material and agrees. Dr. Burt gives the spore size as 13 $\times$ 5½μ, which is much too small. The shape of the spore in his figure is also incorrect since the bent end of the spore should be opposite the mucro end.

Out of eighteen collections from various localities seventeen are on the bark of *Solanum punctulatum*, the eighteenth is on the bark of a species of *Psychotria*. My collections were taken from Portland Gap,

on various locations around Blue Mountain Peak, ravines on the sides of Mossman's Peak, Cinchona, the Mabess Valley and Hardware Gap. *Solanum punctulatum* also occurs at Mandaville, which is in the lowlands; it would be of interest to know if the fungus also occurs there.

This species can be distinguished by its very thick and extensive growth, by its habitat on *Solanum punctulatum*, by the dark brown mycelium with a faint purplish tint when fresh (when dry the purplish tint almost or entirely disappears), and the grayish slate colored hymenial surface in which the probasidia are so often borne in minute clusters. In actively growing specimens the marginal region with its extensive rhizomorphs is very distinctive.

Field observations on this species showed that the fungus-scale insect combination did considerable damage to the host, *Solanum punctulatum*. The fungus often covers the bark on the leeward side of trees for areas of several square decimeters and in a few specimens was seen to extend from near the base of trees as much as thirty feet high almost to the top. Rarely in deeply shaded gaps or ravines small trees were seen girdled by the fungus. Such heavily infected trees were usually quite unhealthy, showing a large number of dead limbs. When the fungus was found on dead limbs or dead trees, it also was dead. The following illustration of this was brought to my attention. On the north side of Portland Gap in the Blue Mountains of Jamaica there occurred a large land slide several years ago. Many trees of *Solanum punctulatum* were uprooted by the slide, and most of them are now dead. The fungus was abundant on many of the dead trees and was invariably dead itself. Another striking illustration is afforded when the main trunk and a small branch are infected at the junction of the two. If, as is often the case, the small branch is girdled by the fungus and dead, then the part of the fungus on the small branch is also dead while the part of the fungus on the main trunk which is still living, is alive.

Septobasidium areolatum n. sp.

Plates 11, 14, 15, 16, 23

Plant body resupinate, growing extensively over the bark of living trees and often forming an area of as much as 60 sq. cm. Deep rich brown over the vegetative portion, the hymenium grayish. Entire surface marked with numerous holes which are 0.2–0.6 mm. in diameter and 1 to 3 mm. apart. Margin indistinct, except with a lens, often indeterminate, irregular, thin and byssoid. In section up to 2 mm. thick when fresh, about 1 mm. thick when dry, often stratified by

the formation of several hymenia over the same area. Composed of three regions: (1) subiculum, about 20–45μ thick, which grows over the surface of the bark and very noticeably penetrates into the phellogen cells destroying their contents and walls; (2) the middle region, 0.8–1.5 mm. thick, composed of brown, loosely packed, branched threads which extend in all directions, threads 3.5–5μ thick, septate, without clamp-connections; (3) the hymenial region, which is about 40μ thick, and composed of probasidia and basidia in various stages of development and of delicate branched hyaline threads, the extensions of the coarser brown threads; probasidia spherical or subspherical, with a slightly thickened wall, 10–12.6μ thick, elongating into an irregularly cylindrical, once septate basidium, each cell of which sprouts a long sterigma and bears on its end a spore. Basidium 8–10 $\times$ 24–33μ, sterigmata 12–25μ long or sometimes longer; basidium as in *S. jamaicaense* except smaller. Spores bent-elliptic, bent like a fish hook, the bend being opposite the mucro, 5.5–6.8 $\times$ 25–30μ, usually becoming thrice septate.

Collected twice on bark of a living deciduous tree, symbiotically associated with scale insects. Many insects were dissected out from beneath the stoma of the fungus which were not parasitized; others, however, were parasitized by very irregular coils of hyphae. No fine threads were present. Mossman's Peak, Blue Mountains, Jamaica, B.W.I., July, 1926.

The basidia of this species closely resemble those of *S. jamaicaense* but the two plants can readily be separated on vegetative characters.

The small and numerous areolations, the rich brown color contrasting with grayish hymenium when present, and the absence of pillars characterize the plant. The areolations are formed in an interesting way. In the absence of upright pillars the middle layer is formed by the development of ridges of hyphae which arise from the subiculum. These ridges branch and anastomose with each other thus forming a network of ridges. The hyphae at the top of the ridges grow out horizontally parallel with the subiculum. This growth always ceases before the space between the ridges is completely bridged and thus the little holes (areolations) in the upper layer are formed.

The hyphae of this species penetrate deeply into the periderm of the bark and develop extensively there. Penetration is most extensive underneath the old, dead remains of scale insects.

Septobasidium papyraceum n. sp.

Plates 10, 15, 17, 23, 24

Plant body resupinate, usually forming very large irregular patches on the bark of living trees, often girdling the limbs and extending for

several decimeters, the hymenial surface resembling a *Corticium*. Surface of fruiting areas smooth in the fresh condition, becoming somewhat wrinkled upon drying, margin of hymenium often incurved, thus forming cup or saucer-shaped fructifications of the small hymenial patches. Entire thallus composed of three distinct areas: (1) the very thin lower layer or subiculum, which extends over the bark and is nearly inseparable from it, subiculum purplish or purplish brown with a narrow whitish margin when fresh; (2) the middle region of upright brownish pillars which arise in irregularly scattered clusters, each cluster of pillars arising from a basal, brownish pad, pillars composed of a few to many parallel threads 8–45μ thick, threads of pillars 3–3.8μ thick, septate without clamp connections, pillars giving rise above to the upper byssoid layer on which the hymenium develops. Hymenium silvery drab to pinkish drab, thin, papery, with an exceedingly compact texture, easily separable from the pillars, 40–50μ thick, composed of probasidia and basidia in various stages of development and slightly coiled threads; threads 3–3.8μ thick, probasidia spherical to oval, 7.4–11.2μ thick, wall not perceptibly thickened, elongating and growing to form the basidia which are 50–60μ long, irregular in thickness and considerably twisted, becoming divided into four cells from each of which a long sterigma grows. Spores 6.6–8.5 $\times$ 18–22.5μ, distinctly recurved and papillate at the distal end, becoming usually two-celled but also not rarely four- or eight-celled.

This species was found three times in the Blue Mountains on the bark of living *Psychotria* trees. Associated with scale insects, many of which are parasitized by irregular coils of hyphae, and others of which are not parasitized (plate 24, fig. 5).

This fungus is easily recognized by the thin, paper-like hymenium with its pinkish drab or silvery drab color which shows a striking contrast to the much darker, brown pillars and subiculum.

Septobasidium frustulosum (Berk. and Curtis) Pat.

Plates 12, 15, 17, 24

Plant body resupinate, growing in medium sized, effused patches, olive-ochre to old gold, with numerous narrow (about 0.1–0.3 mm. wide) sinuous, anastomosing cracks, and sometimes in young specimens with numerous pinholes; margin indistinct, byssoid, concolorous with the context or slightly lighter. In section 0.6–1 mm. thick, composed of three layers: (1) a lower, compact, thin layer of entangled, matted threads which run more or less parallel to the substratum (this layer as a layer is often rather indistinct or entirely absent) about 35–50μ thick; (2) the middle layer of loosely packed, much entangled and branched threads about 2μ thick, arising from the lower layer and passing upward, without the formation of pedicels, to form the hyme-

nium, middle layer 300–550μ thick, broken by numerous connecting channels; and (3) the hymenial region which varies from a few microns thick in the young regions of growth up to 300–370μ thick in the older regions; hymenium stratose by the formation of densely packed layers of basidia; basidia also formed in between the strata, i.e., scattered throughout the hymenial region; hymenial region composed of very densely packed hyphae which are many times dichotomously branched, threads 0.8–1μ thick, the ends of the branches curved backward and often spirally coiled; pyriform probasidia, about 6 $\times$ 15μ, borne laterally on the hyphae, developing into a much twisted, usually four-celled basidium; sterigmata formed from each cell and bearing a single elongated spore. There are also found in the hymenial region numerous, two or three times septate, sausage-shaped bodies, which are either terminal or intercalary. Spores elliptic (only a few immature ones seen).

Collected twice on the bark of living deciduous trees near Cinchona, Jamaica, B.W.I., July, 1926. Associated with scale insects, many of which are parasitized by peculiar hyphae (plate 24, fig. 3). These latter are composed of clavate segments, which are about four to five microns thick at one end and taper down to a fine thread at the other, the fine thread almost always connecting with the larger end but at times the fine thread may arise from the smaller end. The smaller end of the segments are always septate. Such hyphae branch considerably. Other insects, however, are not parasitized. This species is easily distinguished by the olive-ochre to old gold color, by the absence of supporting pillars, by the anastomosing cracks in the fruit bodies, by the dichotomously branched and coiled threads in the hymenium, by the coiled basidia, and by the peculiar, elliptic, septate bodies in the hymenial region.

Septobasidium atropunctum n. sp.

Plates 13, 15, 18, 23

Plant body resupinate, forming a thin, closely adherent crust over the bark, usually girdling the limb and extending for a decimeter or more along its length. Surface rather smooth in the younger areas, becoming cracked in older regions; cinnamon brown with numerous black dots (the coverings for the scale insects) which are 0.3–1 mm. wide. Margin 2–3 mm. wide, byssoid, whitish. In section, 175–265μ thick, composed of three layers: (1) subiculum 50–65μ thick, composed of a dense layer of hyphae which lie next to the bark; (2) the middle region 150–200μ thick, composed of upright hyphae which are grouped in large loose clusters forming thick pillars and leaving small spaces in

between the pillars; (3) hymenial region 30–60μ thick, composed of branched sterile hyphae and probasidial cells, probasidial cells 11.8–14μ thick, wall considerably thickened, spherical or slightly subspherical, sprouting under favorable conditions to form the basidia, the former emptying its entire contents into the latter during the process. Basidia 4.6–5.4 $\times$ 58–70μ, long, narrow, cylindrical, becoming thrice septate, each of the four cells thus formed giving rise to a sterigma which bears a spore. Spores 3–4.2 $\times$ 16–22.5μ, bent-elliptic, usually becoming once or thrice septate, though if kept moist often becoming divided into eight cells.

This species was collected from two localities near Cinchona, Jamaica, B.W.I., on the bark of living trees. Associated with scale insects, some of which are parasitized by irregular coils of hyphae while others are not parasitized.

This is an exceedingly interesting form since it shows an obvious and rather high degree of specialization on the part of the fungus in adapting itself to the needs of the scale insects. The fungus forms a little, flattened, oval-shaped house for the scale insects. The floor is considerably depressed so that the roof is even with the surface of the fungus. The roof is made of an exceedingly compact layer of hyphae and is nearly black in color. One end of the roof is free, thus leaving an entrance. This free margin is fringed with whitish hyphae so that the opening is quite conspicuous under a binocular microscope. If the roof is lifted, nearly every house is found to contain a scale insect. It is only in the marginal regions where the fungus is developing that the houses with "open doors" are found. In the older regions the growth of the fungus has pushed up around the roof and thus more or less closed the entrance. The majority of these older houses are empty, containing nothing but the large, old insects' shell. In a few of these old empty shells, the dried bodies of young were found which were absolutely untouched by the fungus. The new houses contain only small, young scale insects.

It is obvious, although these observations were made on material which I had collected two years previously and on which I was therefore unable to follow the behavior of the living insects, that the young hatch out in the older houses and crawl out of the ones that are not completely closed, migrate out to the marginal region, enter the little houses, and there develop their sucking organs which penetrate the tree for food. In return for this protection the fungus parasitizes many of the insects.

Septobasidium alveolatum n. sp.

Plates 14, 15, 19, 23, 24

Plant body resupinate, forming irregular patches on the bark of living trees, 1 to 3 or more centimeters wide by a few to 10 or 15 cm. long, blackish with a little brown over the vegetative portion, the hymenium grayish. Surface of vegetative part areolate, spiny, presenting as a rule an irregular, finely honey-comb appearance. Hymenium forming over the areolated areas, at first in very small patches, which sometimes anastomose to form a continuous hymenial surface for several square centimeters; hypochnoid at first, becoming compact and smoother with age. Margin very indistinct and irregular, apparent only with a hand lens. In section up to 3 mm. thick when fresh, usually 1–2 mm. thick. Composed of three regions: (1) a very thin inconspicuous subiculum, which creeps over the surface of the bark following especially the cracks and penetrating by means of the cracks as far as the cork cambium; (2) the middle region composed of very loosely packed, slightly wavy hyphae, which are not arranged in pillars or pedicels but in enormous columns; threads dark brown under microscope, septate without clamp-connections, 4–5.4μ thick; (3) the hymenial region which is exceedingly variable in thickness, when well formed from 60–120μ thick, but in old specimens up to 250–350μ thick; composed of probasidia and basidia in various stages of development and numerous hyaline, branched, wavy threads (3.5–4.3μ thick) from the sides of which the former arise. Probasidia spherical or subspherical, 14–17μ thick with a slightly thickened wall, which is as a rule thicker on one side than the other, developing into the basidia by sprouting and emptying its entire contents into the latter; basidia long-cylindrical, usually slightly curved or twisted, rarely straight, becoming divided by transverse walls into four cells, each cell sprouting a sterigma which bears on its end a large spore. Spores white in print, elliptic to bent elliptic, 7.4–11.7 $\times$ 18–29μ, becoming once septate a few hours after formation.

Quite common, collected eight times on the bark of living *Psychotria* sp. and other deciduous trees and often overgrowing epiphytic mosses and liverworts. Portland Gap, Blue Mountain Peak, Mossman's Peak, and Cinchona, Jamaica. June, July 1926. Associated with scale insects, some of which are parasitized by very irregular coils of hyphae, and segmented hyphae, the segments being connected by fine hyphal threads like strings of sausages (plate 24, fig. 2.) Many insects, however, are not parasitized.

This species in appearance to the unaided eye is nearest *S. cirratum* Burt. The color in some specimens of the two plants is practically identical. A careful examination serves, however, to show unmistakable differences in the two plants: *Septobasidium cirratum* in most

specimens shows a much more effused, continuous and compact growth; young specimens, but old enough to be fruiting, strikingly resemble a small foliose lichen with lighter colored and upturned margins; young areas spreading vegetatively over the bark do not show the honeycomb appearance so characteristic of this present form. A comparison of sections under the microscope shows even more distinct differences. The context of *S. cirratum* is very compact, that of *S. alveolatum* very loose. In the surface of *S. cirratum* are numerous coiled threads; these are absent in *S. alveolatum*. The basidium in *S. cirratum* is formed by an elongation of the probasidium forming part of it and is 2-celled, while in *S. alveolatum* the basidium is 4-celled and sprouts from the probasidium which becomes empty and does not form part of the spore-bearing body.

From *S. Langloisii* it can easily be distinguished by the much lighter color of that species, and by surface and basidial characters.

The shape and structure of the probasidia and basidia of the present species suggests a likeness to Patouillard's figures of *S. pedicellatum* (Journ. de Bot. **40**:61. 1892). Patouillard's figures show oval probasidia, while the probasidia of the present species are usually spherical or slightly subspherical. The present species often overgrows mosses and lichens as Burt describes for *S. pedicellatum* (Ann. Mo. Bot. Gar. **13**: 330. 1926), but this is of no specific value in the present case, since so many specimens are free from mosses and lichens. The type material for *S. pedicellatum* is in the Museum of Paris and is therefore unavailable to me for comparison. However, Dr. Burt very kindly loaned a slide showing sections of authentic *S. pedicellatum*, and in these sections the pillars supporting the hymenial layer were very distinct, while in the present species the subhymenial layer has a honeycomb-like structure. Furthermore, in the hymenium of *S. pedicellatum* there were numerous very delicate threads about 1–1.2μ in diameter, whereas the threads in the hymenium of the present species are 3.5–4.3μ thick. The color of the two plants, moreover, is different: in *S. pedicellatum* the color is avellaneous; in the present species the fertile areas are cinereous, the unfertile areas black. I have also examined a collection of *S. pedicellatum* (Schw.) Pat. collected by Earle in Porto Rico on living orange bark (No. 67, N. Y. Bot. Gard. Herbarium). This material agrees well in most respects with Patouillard's and Burt's descriptions. It is avellaneous in color over the hymenial region, and has distinct pillars. In the hymenium are the small threads mentioned by Burt. The probasidia are abundant and agree in shape with Patouillard's drawings but his measurements are considerably larger than are the probasidia in Earle's

collection. *Septobasidium pedicellatum* as represented in Earle's collection differs distinctly from the present species.

Septobasidium Polypodii n. sp.

Plate 20

Plant body resupinate, overgrowing and completely covering the undersurface of fertile fronds of *Polypodium* sp. and parasitizing the sori. Nearly white when fresh, becoming cream-colored upon drying. In section, 250–700μ thick, usually about 500μ thick at the thickest part, whitish throughout, composed of (1) a very thin, lower layer of hyphae which extend over the lower surface of the fern leaf but do not penetrate into the epidermal tissue; and (2) a layer of compact, much branched, coiled and entangled hyphae arising from this lower layer, often stratose by the successive formation of two or three fruiting regions. No pillars present. Probasidial cells formed in the outer surface of the compact layer, oval, 12.5–14.8 $\times$ 16–23μ, wall slightly thickened, germinating into a four-celled, coiled (about in the form of a semicircle) basidium, 8.2–12.6 $\times$ 50–70μ, which in turn bears four spores. Spores elliptic, 6.5–8.5 $\times$ 19–25μ, becoming once septate.

Collected once on *Polypodium* sp. in the Blue Mountains of Jamaica, B.W.I., June, 1926.

This species is distinguished from others by its growth on fern sporophylls, and the absence of scale insects beneath the stroma. It is also conspicuous by the absence of pillars.

When the material was collected it was passed over at the time without much study and was not recognized as a *Septobasidium* until nearly two years later. I am therefore unable to make a full and certain report as to the fungus host relationship. A study of sections made of several infected sporophylls has shown no scale insects underneath the fungus. The fungus starts its development on the naked sori, covering the developing sporangia and their stalks with a mat of hyphae. In several instances cases of penetration by the fungus into the pro-sporangial cells could be made out. The fungus does not penetrate at all into the vegetative parts of the fern sporophyll. In spite of the obvious parasitism a good many of the sporangia mature, forming apparently good spores.

Septobasidium (Unisporum n. subgen.) **purpureum** n. sp.

Plates 12, 15, 21, 24, 25

Plant body resupinate, often covering an area of one to several square decimeters on the bark of living trees; brownish with a purplish tint

except where the hymenium is developed and then dull, neutral gray. Surface in older regions cracked by irregular fissures. Margin indeterminate. In section 300–700μ thick, not distinctly differentiated into layers, pillars absent. Threads of context much branched and entangled, septate without clamp connections, about 3.8μ thick, deep brown under microscope. Hymenium indeterminate, the basidia apparently being formed perennially, the old, empty, probasidial cells scattered throughout the context, the younger probasidial cells and basidia near the surface. Probasidial cells spherical, 8.5–13.8μ thick, usually about 10μ thick, remarkable in having a wall which is much thickened in one-half and very thin in the other; sprouting into a cylindrical basidium which immediately gives rise to a long sterigma on the end of which is borne a single spore. Basidium 6.6–8.4 $\times$ 14.7–25μ, usually thickest in the middle or at the distal end; without septa, but separated from the empty probasidial cell by a wall, sterigma usually apical, rarely lateral, about half as long as the basidium. Spores 7.4–10.4 $\times$ 15.5–19.6μ, elliptic, slightly flattened on one side, pointed or rounded at the distal end, usually becoming divided into eight cells by transverse and longitudinal septa.

Collected twice (Nos. 143 and 146) near Cinchona, Jamaica, B.W.I., July, 1926. On the bark of living deciduous trees; symbiotically associated with scale insects, many of which are parasitized by peculiar, spindle-shaped segments of hyphae, the segments being connected end to end by fine threads, thus resembling strings of sausages (plate 24, fig. 1; and plate 25). Other insects, however, are not parasitized. This species may be recognized in the field by the striking color, thin context, and absence of pillars. In section the non-septate basidium which bears a single spore characterizes the species.

This peculiar species because of the non-septate basidium which bears a single spore, obviously does not belong in the section of the genus *Septobasidium* with *S. pedicellatum* and the other species with septate basidia. Its symbiotic association with scale insects, habit of growth and the structure and development of the probasidia, basidia, and spores, excepting alone the non-septate basidia, show a very close relationship to *Septobasidium*. I am, therefore, establishing a new subgenus to include this species.

A very striking observation, in the species of *Septobasidium* studied by the writer, is that in the species in which the basidium is divided into four cells, as in *S. alveolatum*, the spores are normally only once septate and thus two-celled; and in the species in which the basidium is two-celled, as in *S. jamaicaense* Burt, the spores are normally four-celled; while in the present species, the basidium is one-celled and the spore is

eight-celled. The regular septation in the spores occurs shortly after they are discharged if kept in a moist chamber; if, however, the spores are kept in water the septations are quite irregular and if kept in a nutrient solution or on agar they form many sporidia by budding.

Helicobasidium arboreum n. sp.

Plates 14, 15, 22, 23, 24

Plant body resupinate, forming rather thin, cracked areas on the bark of living trees; largest areas up to about 6–8 sq. cm. in extent. Unfertile areas blackish brown, myceloid. Hymenial surface light gray, forming a more or less cracked and granulated surface over the much darker colored, subhymenial hyphae. In section composed of (1) the vegetative hyphae which penetrate throughout the cortex region developing particularly in the cells of the cork cambium and phloem, intracellular hyphae colorless; (2) the superficial vegetative hyphae, which are very dark colored, septate without clamp connections, very loosely packed, 4–8.4μ thick close to the base, not arranged in pillars but arising individually and branching many times to form a dense cluster of hyaline, delicate, coiled and twisted hyphae. Hymenium composed of these clusters of hyphae among which are borne the spore-bearing bodies or basidia. Basidia not arising from an obviously pre-formed resting cell. Mature basidium one to one and one-half times coiled, and thrice septate, 4.8–7.4μ thick by 33–40μ long. From each of the four cells of the basidium a long sterigma grows to the hymenial surface and bears a long, narrow, elliptic spore, distinctly bent at the distal end and usually once septate but not rarely three times septate; spores 5–5.9 $\times$ 21–30μ, white in a spore print.

Collected only once and then on the bark of a living deciduous tree on the Blue Mountain Trail, Jamaica, June 1926. Associated with scale insects, many of which are parasitized by irregular, bent spindle-shaped segments of hyphae which are connected by fine threads (plate 24, fig. 4). Many insects, however, are not parasitized.

This species can be recognized with the unaided eye by the gray color and peculiar granulated surface of the hymenium. In microscopic section the thick dark colored hyphae arising individually and branching to form a dense cluster of hyaline, delicate, twisted hyphae and the coiled basidia are distinctive. I am calling this species *H. arboreum* because of the rather striking similarity of the thick, single, upright hypha with its apical branches to the shape of the stem and branches of a tree.

EXPLANATION OF PLATES

PLATE 15

All figures on this plate are semi-diagrammatic. All figures ×33, except Fig. 1.

Fig. 1. Section through very thick region of *S. jamaicaense* Burt, where four hymenial regions had been formed. ×6.

Fig. 2. *H. arboreum*, showing the tree-like clusters of hyphae.

Fig. 3. *S. atropunctum*, showing the thin hymenium and the short pillars and threads penetrating into the crevices of the bark.

Fig. 4. *S. areolatum*, showing holes (areolations) in context covered here by the hymenium. Note the scale insect with its sucking apparatus penetrating the wood.

Fig. 5. *S. papyraceum*, showing thin erect pillars and part of a scale insect to right.

Fig. 6. *S. frustulosum*, showing exceedingly thick columns of hyphae, and hymenium with dichotomously branched, coiled hyphae.

Fig. 7. *S. purpureum*, showing context without pillars, etc. Note scale insect to right with sucking apparatus extending down into the wood.

Fig. 8. *S. alveolatum*, showing an alveolus covered by the hymenium. Note empty scale at bottom of fungus.

PLATE 16

S. jamaicaense. Figs. 1–5.

Figs. 1–4. ×873. Probasidium, the small body on left, and basidia in various stages of development. Fig. 4 shows an empty basidium with two long sterigmata. Fig. 5. Spores with sterigmata and one sporidium, abnormal. ×720.

S. areolatum. Figs. 6–15. All ×873.

Figs. 6–13. Development of basidium from the stage when it becomes septate to the empty basidium.

Figs. 14, 15. Spores, fig. 14 an abnormal one.

PLATE 17

S. papyraceum. Figs. 1–14. All ×847.

Figs. 1–14. Development of basidium from the probasidium up to the formation of sterigmata. Fig. 14. A basidium which has fallen from the parent hypha.

S. frustulosum. Figs. 15 and 16. ×847.

Fig. 15. Basidium with four sterigmata.

Fig. 16. Part of the hymenium showing dichotomously branched hyphae, probasidia, and coiled basidia, one with a spore. Note also the septate bodies, perhaps gemmae.

PLATE 18

S. atropunctum. Probasidia and basidia in all stages of development; pillars and subiculum. ×558.

PLATE 19

S. alveolatum. All ×873. Development of probasidium into the basidium and the formation of spores.

PLATE 20

S. Polypodii. Section of infected sporophyll, below, showing how the fungus grows in and around sporangia. ×37. Above, section of hymenium showing probasidia and basidia. ×1012.

PLATE 21

S. purpureum.

Figs. 1–11. Development of probasidium into basidium which bears a single spore. ×1016.

Figs. 12–14. Showing how spores if kept moist may divide into eight cells. ×1280.

PLATE 22

Helicobasidium arboreum. All ×1310.

Fig. 1. Basidium and coiled threads borne on very thick hypha.

Figs. 2–6. Basidia, figs. 4 and 5 showing sterigmata.

Fig. 7. Spore sprouting two sterigmata, which is unusual.

PLATE 23

Spores.

Fig. 1. *S. atropunctum* ×578; Fig. 2. *Helicobasidium arboreum;* Fig. 3. *S. alveolatum;* Fig. 4. *S. jamaicaense;* Fig. 5. *S. papyraceum;* Fig. 6. *S. areolatum.* Figs. 2–6 × 982.

PLATE 24

Fig. 1. Haustoria from within body of a parasitized scale insect beneath *S. purpureum.* Haustoria consisting of spindle-shaped segments of hyphae connected by fine threads, like strings of sausages.

Fig. 2. Haustoria from within body of a parasitized scale insect beneath *S. alveolatum,* consisting of sausage-shaped hyphae and irregular coils of hyphae.

Fig. 3. Haustoria from within body of a parasitized scale insect beneath *S. frustulosum.* Note cross wall at the smaller end of the segments.

Fig. 4. Haustoria from within body of a parasitized scale insect from beneath *Helicobasidium arboreum.* Note how the segments are entangled and how almost every segment is bent.

Fig. 5. Haustoria from within body of a parasitized scale insect from beneath *S. papyraceum.* Haustoria consist of more or less regularly coiled hyphae.

Fig. 6. Haustoria from within body of a parasitized scale insect from beneath *S. jamaicaense.* Haustoria consist of irregular coils of hyphae. All figures ×952.

PLATE 25

Semi-diagrammatic view of section of *S. purpureum* showing a parasitized scale insect over which the fungus has developed a dense pad of hyphae and the host plant into which the insect's suctorial apparatus penetrates. *P.B.*, probasidia; *B*, basidia; *B.S.*, basidiospores; *O.B.*, old collapsed basidia; *H.P.*, hyphal pad; *D.S.*, insect's dorsal scale; *.VS.*, ventral scale; *I.*, insect; *P.A.*, insect's pumping organ; *S.A.*, insects suctorial "tube" represented by the two middle solid lines; *H.S.*, sheath of cellulose material secreted around the suctorial apparatus; *M.R.*, medullary ray cells; *N.*, nuclei of host plant; *H.*, haustoria of the fungus inside the body of living insect. ×135.

THE
JOHN CRERAR
LIBRARY

PLATE 10

SEPTOBASIDIUM PAPYRACEUM

Note the small circular patches of pillars on the piece to the left and second from the right. Under each is a scale insect. The hymenium is whitish. Photograph by Paul F. Shope.

THE
JOHN CREERAR
LIBRARY

PLATE 11

SEPTOBASIDIUM JAMAICAENSE [above]
Note the distinct rhizomorphs

SEPTOBASIDIUM AREOLATUM [below]
Note areolations. The grayish areas are hymenium. Photograph by Paul F. Shope.

THE
JOHN CRERAR
LIBRARY

PLATE 12

SEPTOBASIDIUM PURPUREUM [above and two pieces on left below]
SEPTOBASIDIUM FRUSTULOSUM [three pieces on right below]
Photograph by Paul F. Shope

PLATE 13

SEPTOBASIDIUM ATROPUNCTUM

Note the minute dark dots on the piece to right near bottom and next piece near top. Photograph by Paul F. Shope.

THE
JOHN CREERAR
LIBRARY

SEPTOBASIDIUM ALVEOLATUM [top, middle and right]

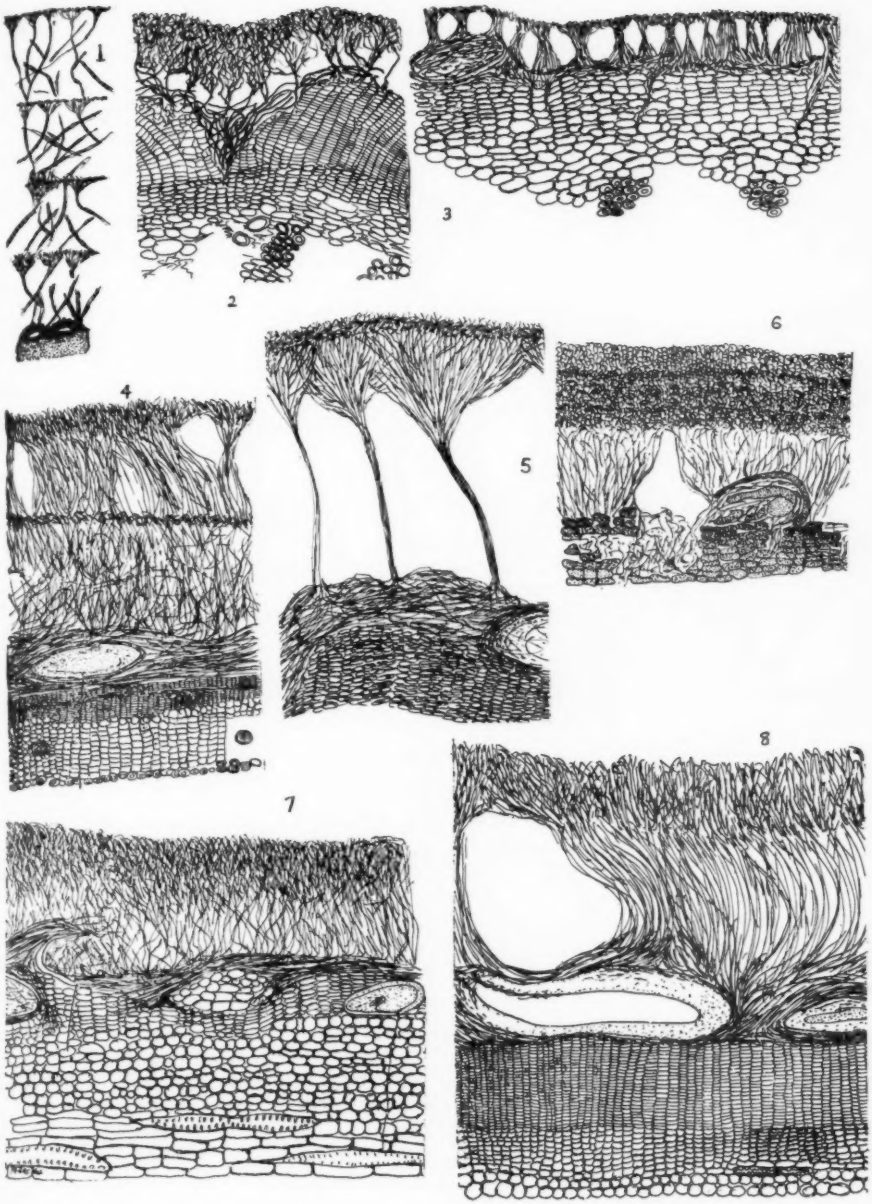
Note the irregularly honey-comb appearance of the piece to the right. The grayish areas are hymenium.

HELICOBASIDIUM ARBOREUM [four pieces on left below]

Photograph by Paul F. Shope

THE
JOHN CRERAR
LIBRARY

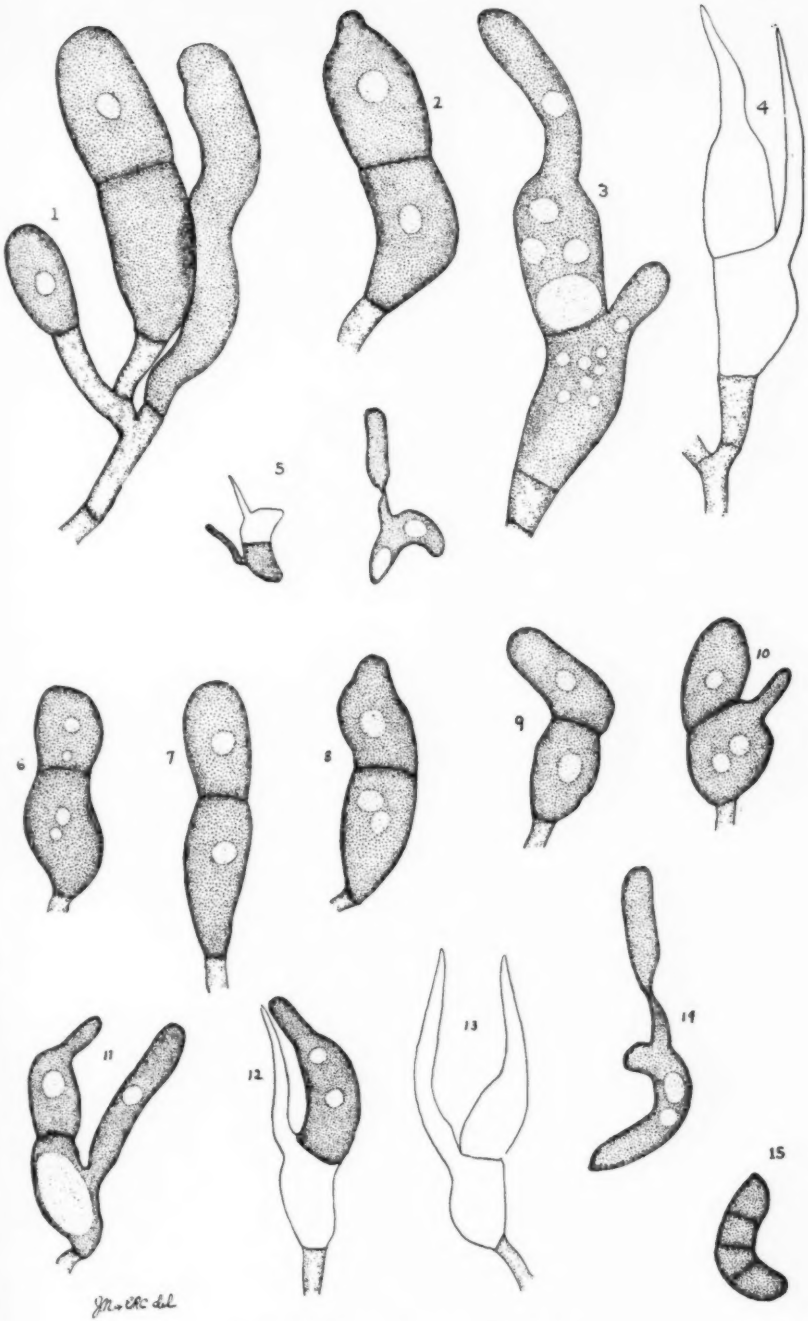
PLATE 15



SEMI-DIAGRAMMATIC SECTION VIEWS OF SPECIES OF SEPTOBASIDIUM

THE
JOHN CRERAR
LIBRARY

PLATE 16

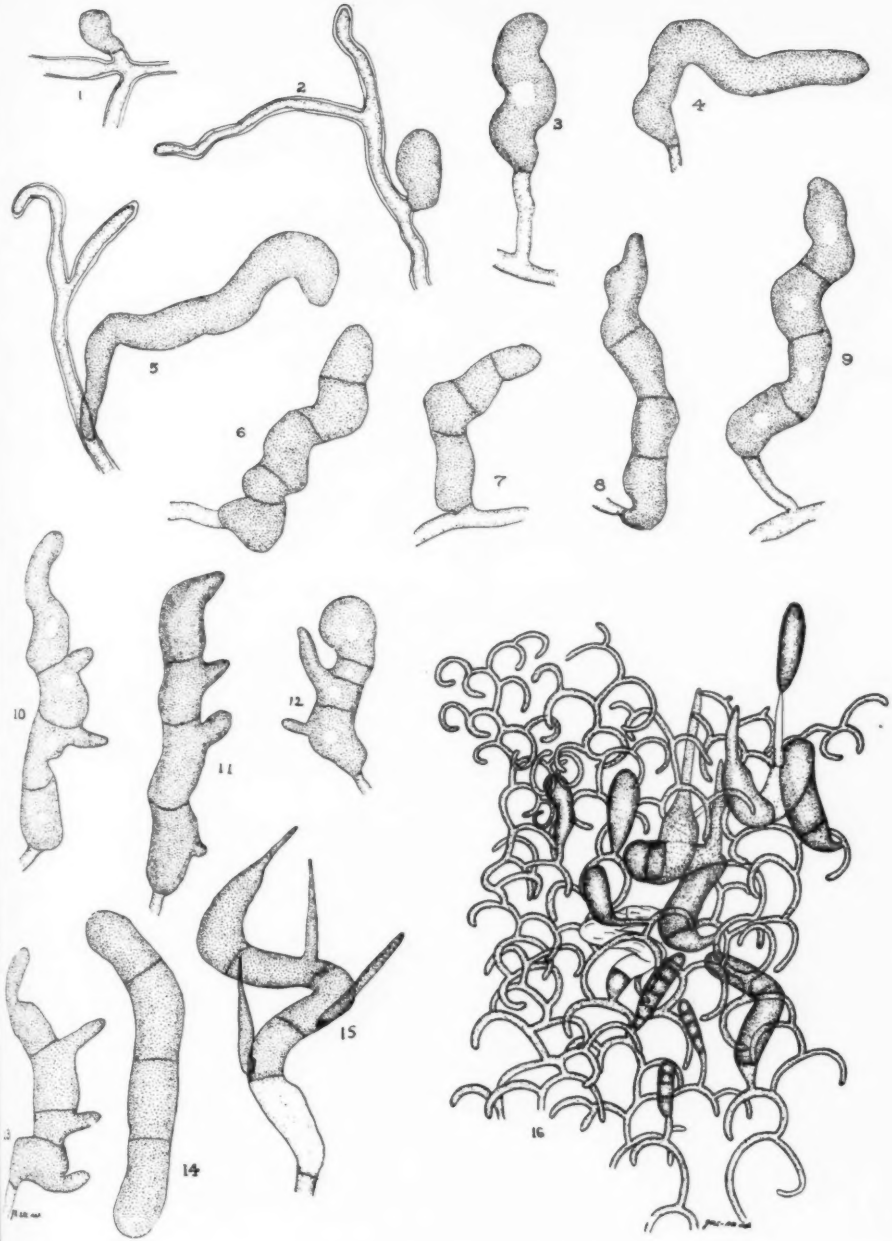


SEPTOBASIDIUM JAMAICAENSE [above]

SEPTOBASIDIUM AREOLATUM [below]

THE
JOHN CRERAR
LIBRARY

PLATE 17

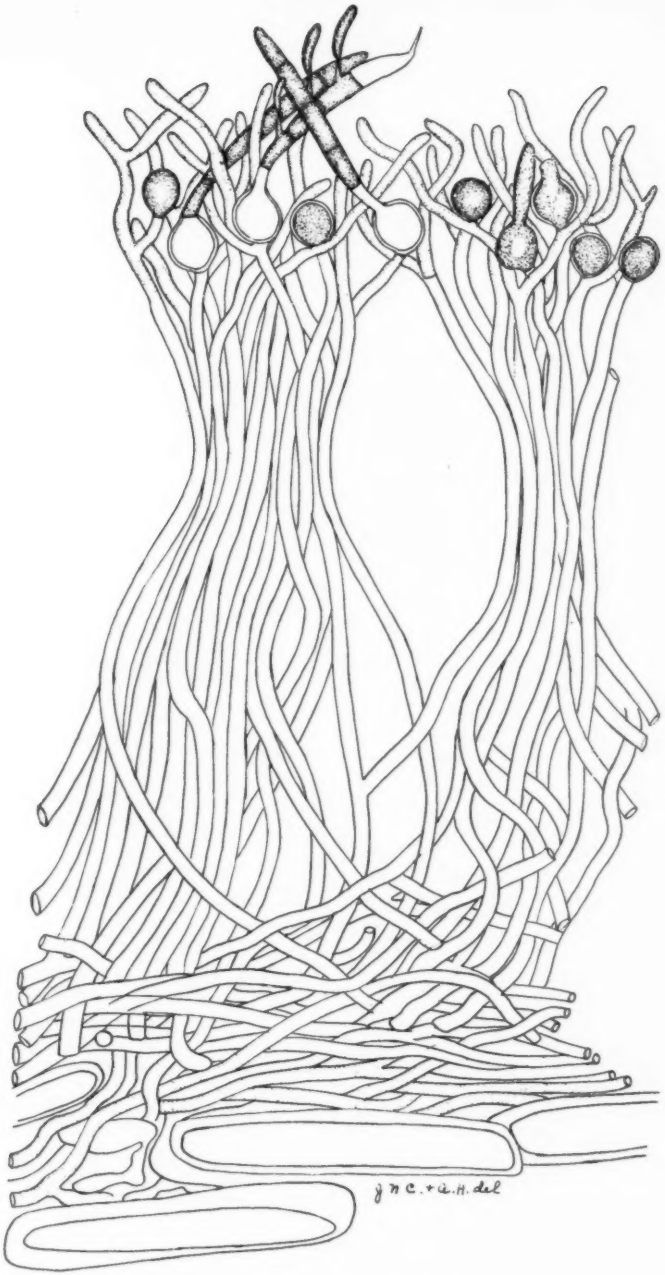


SEPTOBASIDIUM PAPYRACEUM [Figs. 1–14]

SEPTOBASIDIUM FRUSTULOSUM [Figs. 15, 16]

THE
JOHN CRE
LIBRARY

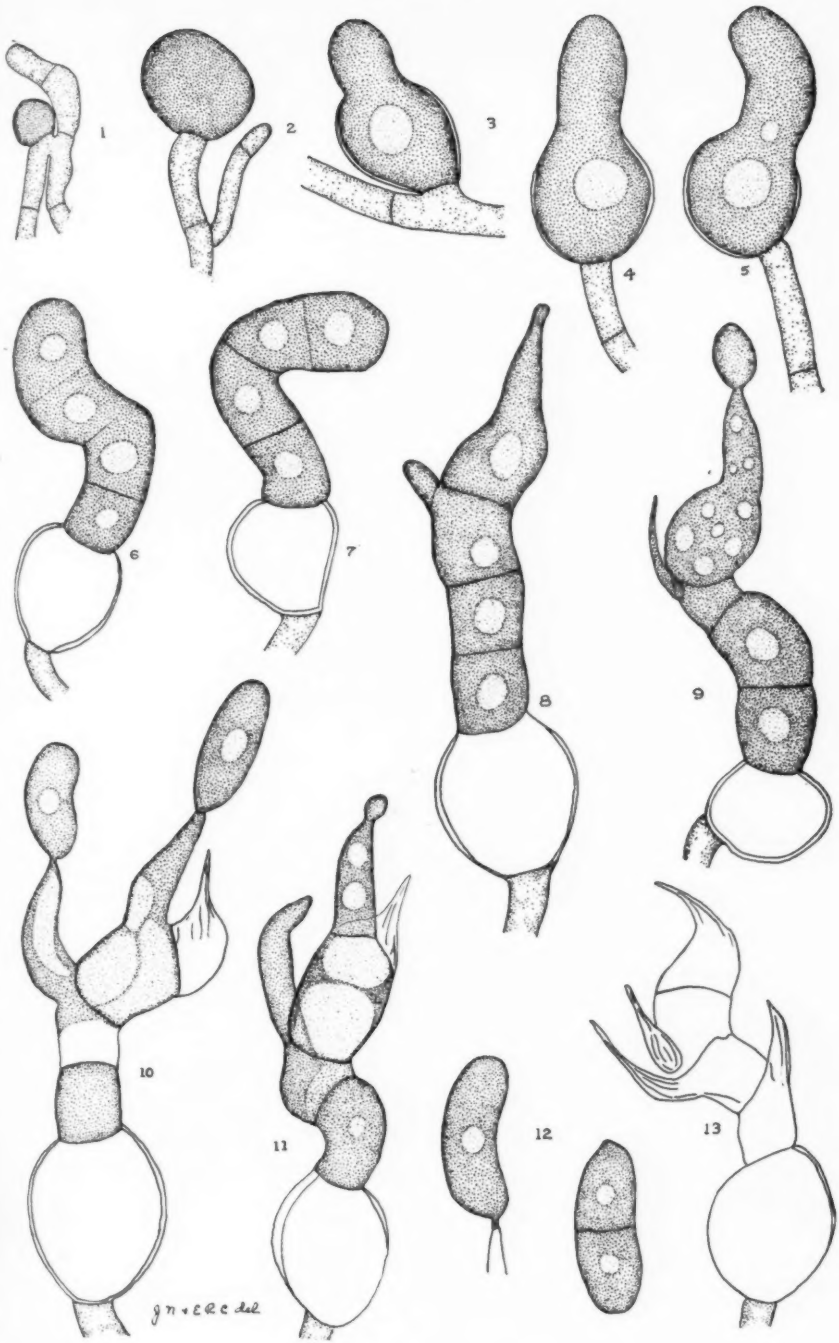
PLATE 18



SEPTOBASIDIUM ATROPUNCTUM

THE
JOHN CREAR
LIBRARY

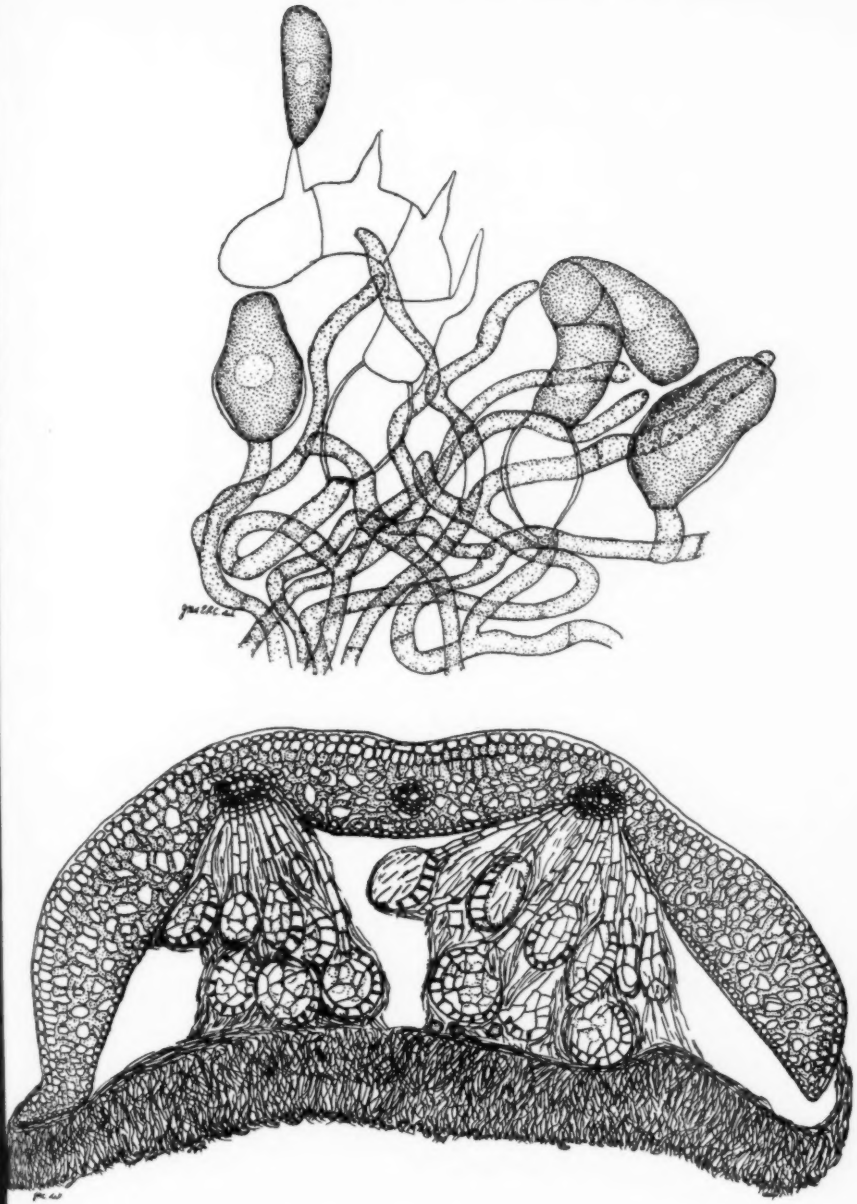
PLATE 19



SEPTOBASIDIUM ALVEOLATUM

NORTH ORTHAL
LIBRARY

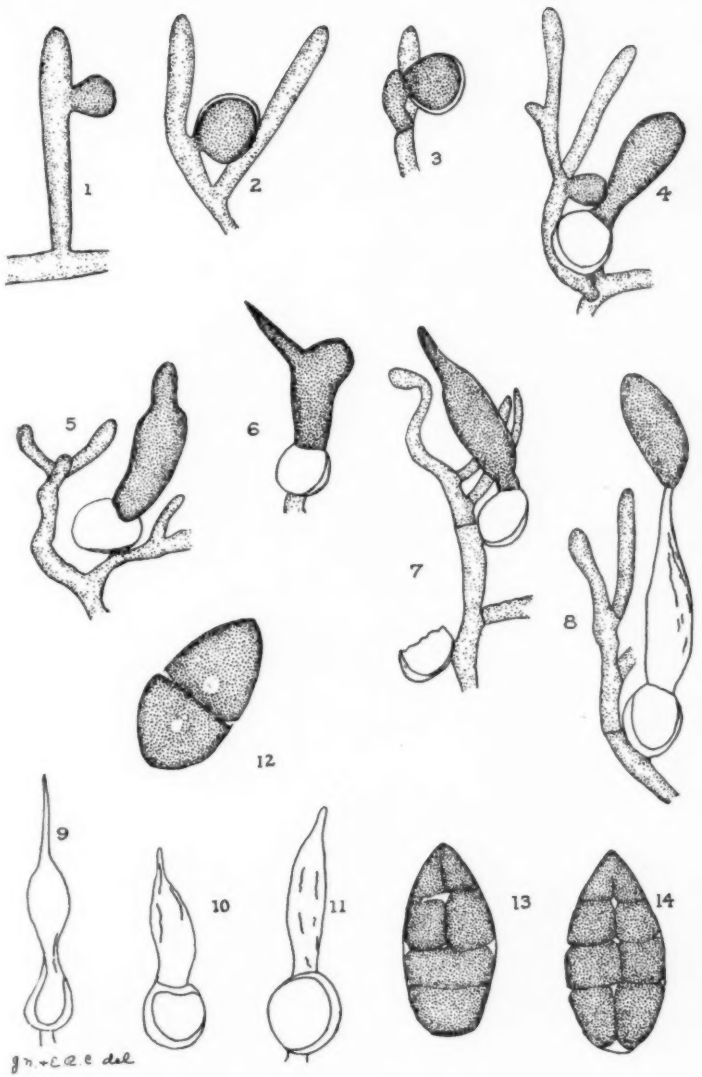
PLATE 20



SEPTOBASIDIUM POLYPODII

THE
JOHN CRERAR
LIBRARY

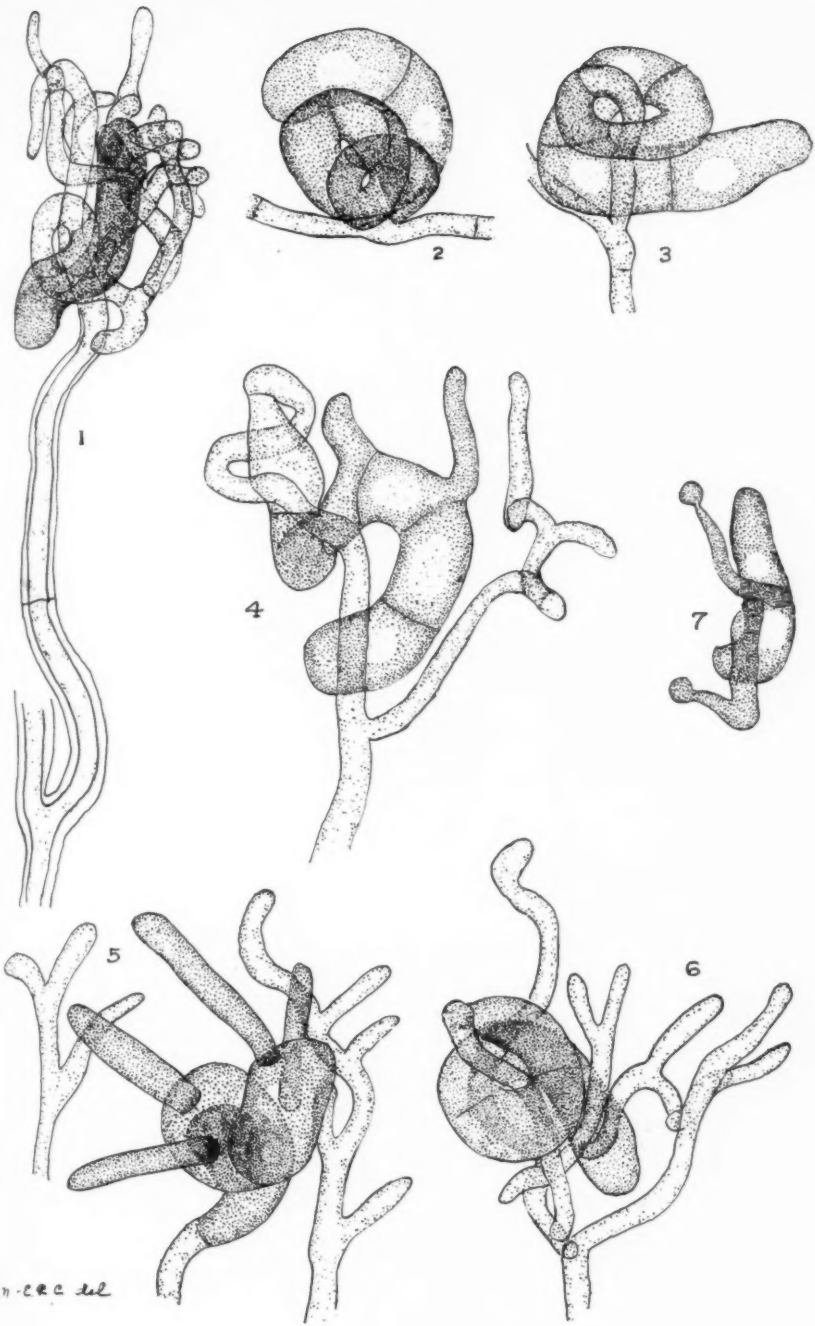
PLATE 21



SEPTOBASIDIUM PURPUREUM

JOHN CRERAR
LIBRARY

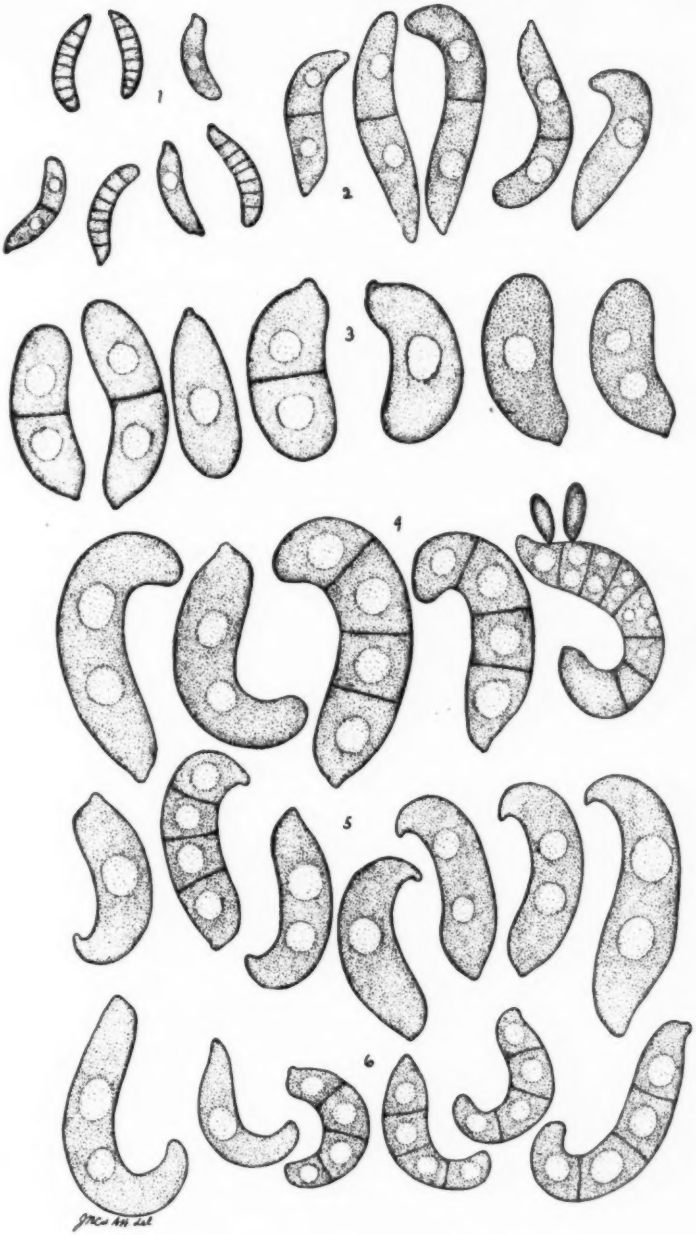
PLATE 22



HELICOBASIDIUM ARBOREUM

THE
JOHN CREERAR
LIBRARY

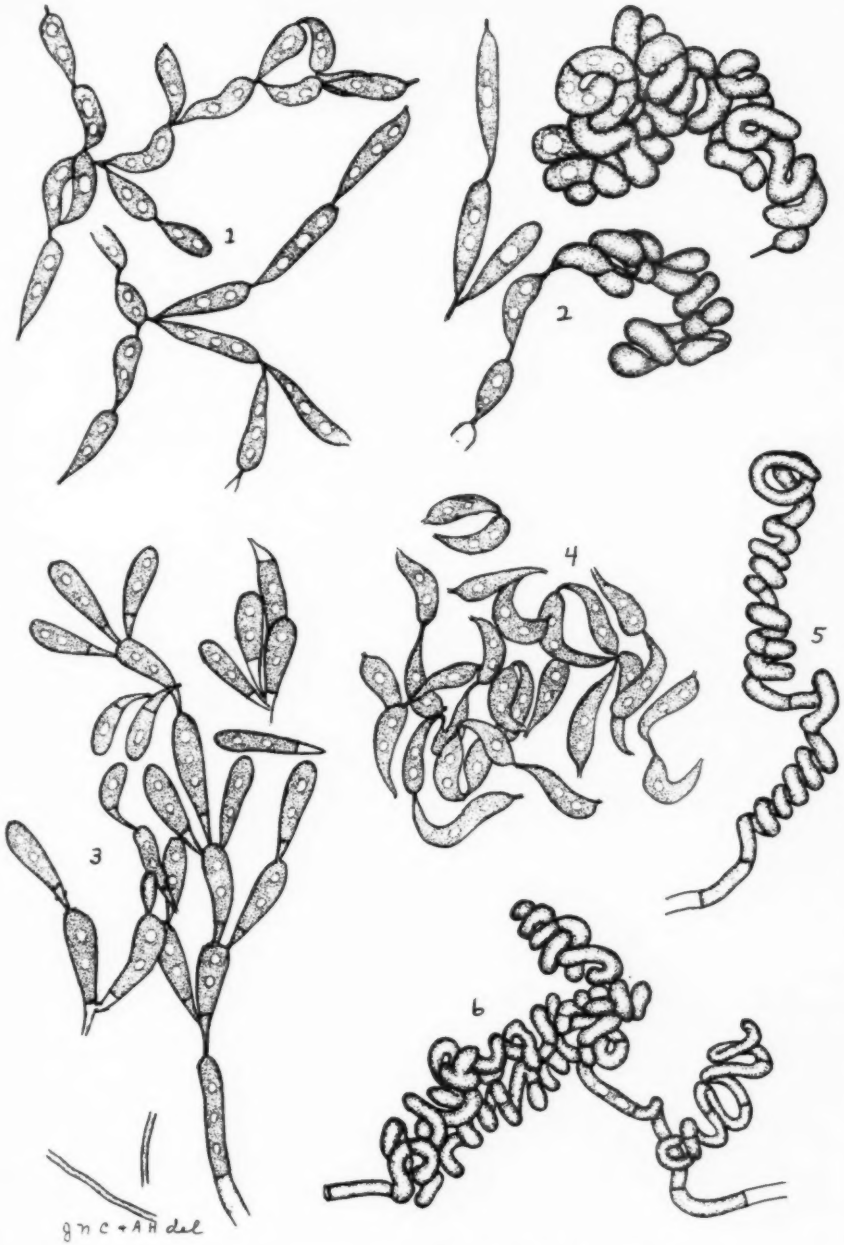
PLATE 23



SPORES OF VARIOUS SPECIES OF SEPTOBASIDIUM

THE
JOHN CREE
LIBRARY

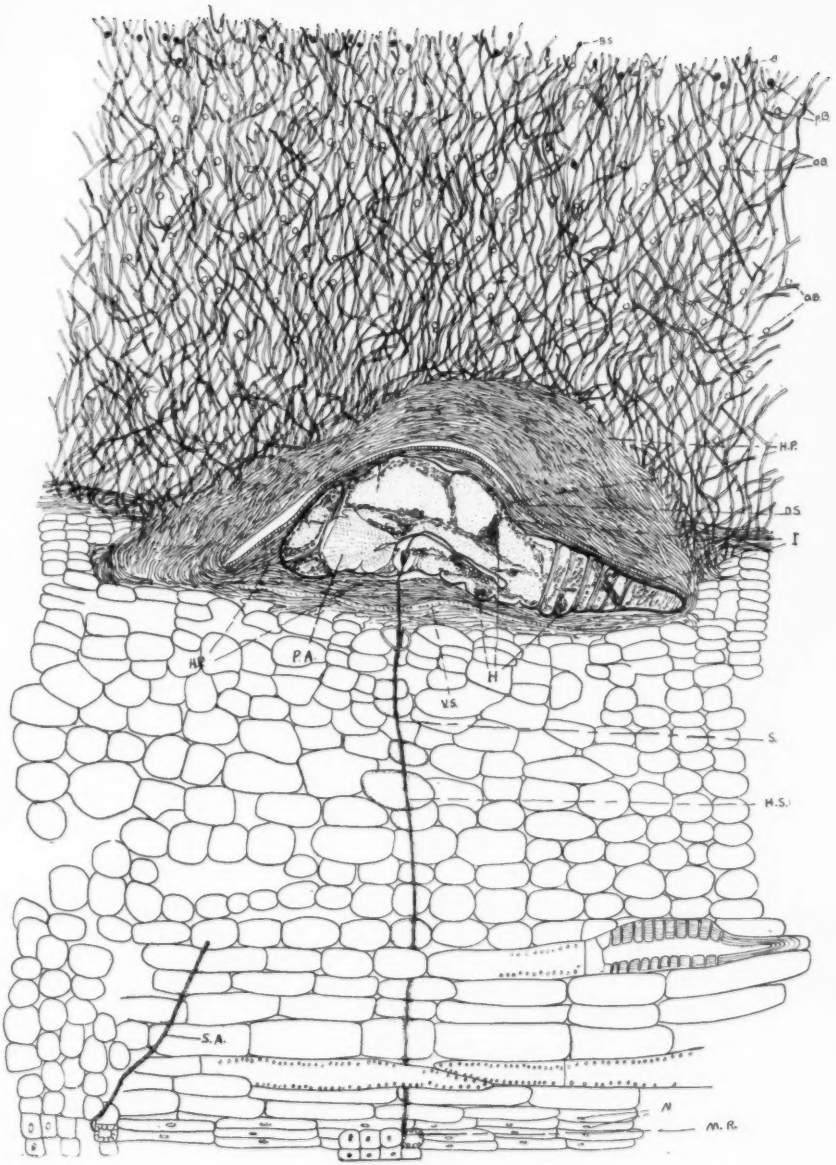
PLATE 24



TYPES OF HAUSTORIA FROM BODIES OF SCALE INSECTS

THE
JOHN CRERAR
LIBRARY

PLATE 25



SECTION OF SEPTOBASIDIUM PURPUREUM AND TYPICAL PARASITIZED SCALE INSECT AND PART OF THE BARK OF HOST PLANT, SHOWING SUCTORIAL APPARATUS PENETRATING THROUGH BARK TO MEDULLARY RAY CELLS

THE
JOHN CREERAR
LIBRARY

INDEX TO VOLUMES 38–44

	Vol.	Page
Acanalonia fasciata	38	190
Acetyl acetone, The action of phenylsemicarbazide on. Abstract	40	110
Acetylene upon zirconium tetrachloride, Reaction of methane and also of	38	74
Achlya and Aphanomyces, Some observations on spore formation and discharge in Leptolegnia	40	27
Achlya abortiva	42	143
abortiva, contorted form	42	211
abortiva forma normalis	42	209
bisexualis	42	207
caroliniana	42	144
inflata	42	211
subterranea	42	141
Achlya colorata, Fertilization and oogenesis in	43	108
Ader, O. B., and Gyfford, D. Collins. The fraction of the mass of various types of springs which is accelerated in simple harmonic motion. Abstract	44	28
Adiabatic changes, A method of detecting small. Abstract	44	29
Aerobes in water	44	75
Agaricus abruptus	43	247
amygdalinus	43	249
auricolor	43	249
Age and area hypothesis. Abstract	39	38
Age of the earth, Brief notice of a new radioactive method of determining the. Abstract	41	21
Age of the ocoee and associated rocks of Clay County, Alabama. Abstract	38	16
Age of the universe	42	179
Ageniella aludra	43	201
mintaka	43	202
Alcohol, Changes induced in the kidney by continued use of. Abstract	38	33
Aleurodiscus apiculata	43	137
Allomyces moniliformis	42	139
Allport, Floyd H. Facial expressions and how we react to them. Abstract	39	34
Amanita Gwyniana	43	140
Roanokensis	43	141
Amaurobius armipotens	41	170
bennetti	41	170

	Vol.	Page
hoplites	41	171
hoplomachus	41	172
Ambystoma mabeei	43	157
Amines on dichloro- and trichloroacetic acids, Action of. Abstract	40	112
Amoeba culture methods, Recent improvements in. Abstract	39	15
Amobae, Contractile vacuoles in—factors influencing their formation and rate of contraction	39	49
Amoebidium parasiticum	44	126
Amoeboid cells in Perophora, Some peculiar. Abstract	40	113
Amphibians and reptiles of North Carolina, Revised key and list of the	42	75
Amphibians and reptiles from the southeastern states with a description of a new salamander from North Carolina	43	153
Anahita punctulata	41	184
Anderson, D. B. The structure of cotton fiber. Abstract	43	15
The structure and development of flax fiber. Abstract	43	15
Anderson, H. B. Spirocheticidal action of arsphenamin (salvarsan, "606"). Abstract	38	31
Aneides aeneus	43	163
Antigens of the bacteria, Non-protein	42	135
Antiseptics on the activity of pepsin, Inhibitory action of. Abstract.	41	43
Aphanomyces exoparasiticus	41	216
laevis	41	215
phycophilus	41	214
Aphanomyces, Some observations on spore formation and discharge in Leptolegnia, Achlya, and	40	27
Aphanomyces, with a description of a new semiparasitic species, Notes on the genus	41	213
Aphelonema rosa	38	188
Aplanes Treleaseanus	42	217
turfosus	42	216
Appalachian area, Typical structures of central. Abstract	44	14
Appalachian Forest Experiment Station, The research program of	39	70
Arachnids found on Nigerian rodents and insectivores	43	171
Arachnion album	42	256
Arbuckle, H. B. Effect of heat upon the viscosities of lubricating oils. Abstract	41	19
Life and habits of the honey bee	41	47
(With O. J. Thies, Jr.) Variation of protein content of corn		
Paper I	38	84
Paper II	39	56
Paper III	40	176
Paper IV	41	64
Paper V	42	113
(With O. J. Thies Jr.) A zinc spot in the Marsh test	43	50
Area hypothesis, Age and. Abstract	39	38

	Vol.	Page
Arrhytidia enata	43	237
flava	43	237
involutus	43	237
Arsphenamin (salvarsan, "606"), Spirocheticidal action of. Abstract	38	31
Ascidia, Structure of heart muscle of. Abstract	40	109
Ascidian blood, Studies in. Abstract	40	105
Ascidian, Ecteinascidia turbinata Herdman, Some points in the bud development of a simple	39	92
Ascidians, Dedifferentiation in hydroids and	39	40
Ascidians, The histology of the blood of. Abstract	43	25
Ashe, W. W. Azalea in North Carolina	38	90
Common names of some trees	39	89
Financial value of forest cover for protecting reservoirs for power. Abstract	42	13
Notes on shrubs of the southeastern states	39	110
Notes on woody plants		
Paper I	40	43
Paper II	41	267
Asparagus fern, Blight of	43	91
Asphaltogenic bodies in American lubricating oils. Abstract	43	21
Astraeus	39	219
hygrometricus	39	219
Atkins, E. W. Efficiency of the eye under different intensities of illumination. Abstract	41	38
Atom and Albert Einstein, New world of the	41	70
Atom, Search for the ultimate	38	35
Atomic nucleus, Structure of. Abstract	41	41
Attheyella caroliniana	41	252
sp. (?)	41	254
Audion and its application to the wireless telephone, Theory of. Abstract	38	28
Avery, George S., Jr. Structural anomalies in embryos of maize. Abstract	44	19
Azalea in North Carolina	38	90
Bacteria, Methods for class demonstration of hydrogen sulfide formation by. Abstract	40	107
Bagwell, John C. A study of direction trends in maze learning of white rats	43	105
Basidiomycetes, New or noteworthy	42	251
Basidiomycetes, Notes on	43	129, 233
Bass, L. A., and F. C. Vilbrandt. Asphaltogenic bodies in American lubricating oils. Abstract	43	21
Beardslee, H. C., and W. C. Coker. Laccarias and Clitocybes of North Carolina	38	98
Mycenas of North Carolina	40	49

	Vol.	Page
Becton, Clara, and Bert Cunningham. Occurrence of an ova-testis in Bufo terrestris. Abstract	42	14
Beers, C. Dale. Some points in the bud development of a simple ascidian, Ecteinascidia turbinata Herdman	39	92
The relation of diet to vitality in one-celled animals. Abstract	44	50
Bees, New megachilid	40	154
Beet sugar, Manufacture of. Abstract	38	29
Behavior and longevity of a joint worm parasite, Eurytoma sp., The relation of temperature, light, and humidity to the	42	99
Bell, F. M. Rainfall characteristics of North Carolina. Abstract	44	15
Bell, J. M. Electrometric methods of chemical analysis. Abstract	41	38
Some approaches to fundamental theory of the physical sciences	44	53
Belvosia orion	43	205
Bergamot mint in Chapel Hill, Cultivation of. Abstract	44	24
Berthold, Lloyd M. Recent improvements in amoeba culture methods. Abstract	39	15
Biology, Notes on the teaching of	39	86
Bishop, S. C. (With C. R. Crosby.) Notes on the Opiliones of the southeastern United States with descriptions of new species	40	8
(With C. R. Crosby.) Notes on the spiders of the southeastern United States with descriptions of new species	41	165
Notes on some amphibians and reptiles from the southeastern states with a description of a new salamander from North Carolina	43	153
Blight of the soybean, Pod and stem. Abstract	38	13
Blomquist, H. L. Dormancy in the seeds of the persimmon	39	83
Notes on the teaching of biology	39	86
Some of the hepaticae of North Carolina. Abstract	39	11
Blood groups, Human: their inheritance and racial significance. Abstract	42	10
Blood, Influence of pregnancy on the stability of the acid-base equilibrium of the. Abstract	42	19
Blood on kidney functions and pathology, Effect of changing the chemical constitution of the. Abstract	40	115
Blood, Studies in ascidian. Abstract	40	105
Blood of ascidians, Histology of. Abstract	43	25
Blood sugar of the rabbit, The influence of ultra-violet radiations on the	43	187
Boletus parasiticus	42	255
Borneol in spruce turpentine, Occurrence of. Abstract	40	111
Bosmina longirostris	41	243
longispina	41	242
Bothriocera drakei	38	179
Boyd, James E. Some types of plane cubic curves. Abstract	44	27
Bradbury, O. C. Some phases of the embryology of the carnation mite	42	94

	Vol.	Page
Brannon, C. H. Relation of temperature, light, and humidity to the behavior and longevity of a joint worm parasite (Eurytoma sp.).	42	99
Life history of the plum curculio (Conotrachelus nenuphar Herbst)	43	79
Braune, G. M. Experimental determination of lateral earth pressures. Abstract	38	26
Braxton, H. H., and W. C. Coker. New water molds from the soil	42	139
Brevilegnia	42	212
bispora	42	228
diclina	42	243
linearis	42	214
subclavata	42	229
unisperma var. delica	42	214
unisperma var. montana	42	213
Brimley, C. S. Copperhead snake at Raleigh, N. C	39	17
Identification trials. Abstract	40	106
Revised key and list of the amphibians and reptiles of North Carolina	42	75
Seasonal catch of snakes at Raleigh, N. C	41	100
Twenty years of the North Carolina Academy of Science	38	46
Water Dogs (Necturus) of North Carolina	40	166
Some new wasps (Hymenoptera) and two new Diptera from North Carolina	43	199
Two new terrapins of the genus Pseudemys from the southern states	44	66
Brooks, F. P., and A. S. Wheeler. Action of phenylsemicarbazide on acetyl acetone. Abstract	40	110
Browne, E. T. General properties of involutions in n-ary algebra. Abstract	41	26
Involutory collineations belonging to a pencil. Abstract	42	21
On the signature of a quadratic form. Abstract	44	26
Note on the characteristic equation of a matrix. Abstract	44	48
Brownian movements	40	1
Bruchomorpha bicolor	38	186
decorata	38	188
minima	38	187
rugosa	38	186
vittata	38	185
Bullitt, J. B. Simple microphotographic apparatus. Abstract	39	17
Bush, L. E. Method of solving simultaneous quadratic equations. Abstract	42	15
A formula for computing transvectants in non-symbolic notation. Abstract	44	25
By-Laws of the North Carolina Academy of Science, September, 1925.	41	3
Cain, William: Mathematician and Engineer	39	123

	Vol	Page
Cain, William. Maxwell's theorems of relative displacements. Abstract	41	39
Calcium content of mixed feeds in relation to feeding requirement of animals. Abstract	38	12
Calocera glossoides	43	239
Calyptralegnia	42	219
Cambarus, Some phases of digestion in. Abstract	39	16
Campbell, Roy J. Spore-forming, gas-producing aerobes in water	44	75
Campulosis aromaticus, Morphological ecology of savannah plants. Abstract	41	17
Capillary moisture in highway subgrades. Abstract	40	118
Capron, John D. New deLavaud method of making cast iron pipes by a centrifugal process. Abstract	39	86
Carnation mite, Some phases of the embryology of the	42	94
Carnegie Institution, Magnetic surveys by the. Abstract	40	114
Carr, P. H. Recovery of selenium from the effect of X-rays. Abstract	42	16
Castanea Margaretta		
arcuata	40	46
augustifolia	40	46
paucispina	41	268
Castaneira amoena	41	185
Catlett, G. F. Chemistry in its relation to the state water supplies	38	94
Catonia carolina	38	176
luella	38	177
lunata	38	178
pini	38	177
Cave fauna	43	84
Cell sap of plants in relation to environmental conditions, Density of the	39	63
Centrifugal process New deLavaud method of making cast iron pipes by a. Abstract	39	36
Ceracea aureo-fulva	43	237
corticoides	43	237
Cerceris crawfordi	43	199
shermani	43	200
Cercospora disease of soy beans. Abstract	43	14
Ceriodaphnia lacustris	41	240
Ceropales hatoda	43	201
Chemical analysis, Electrometric methods of. Abstract	41	38
Chemical constitution of the blood on kidney functions and pathology, Effect of changing the. Abstract	40	115
Chemical industries in North Carolina		
In 1922	39	76
Opportunities for	40	181
Recent developments in	41	115
The status of, in 1926	43	55

	Vol.	Page
Chemical warfare—methods of attack and defense. Abstract	38	30
Chemistry, Muscle Shoals and. Abstract	40	120
Organic, Research in progress in, at the University of North Carolina	38	25
Relation to the state water supplies	38	94
Chicks incubated for five days under increased pressure and normal pressure. A comparison of. Abstract	42	10
Choanephora conjuncta	41	143
Choanephora, New dioecious species of	41	141
Chromosomes of the opossum, Somatic. Abstract	41	38
Chrysemys cinerea, Some phases in the development of	38	51
Chydorus sphaericus	41	243
Cicurina breviaria	41	196
cavealis	41	197
Ciocixius	38	183
Cixius apicalis	38	182
Circulation, pulmonary, in vertebrates. Abstract	38	9
Cladocera, Plankton collections in Lake James, North Carolina—copepods and	41	228
Clathrus columnatus	38	236
Clavaria Stillingeri	42	251
Clitocybe adirondackensis	38	115
cerussata	38	108
clavipes	38	116
conglobata	38	111
cyathiformis	38	120
dealbata	38	124
ectypoides	38	119
gigantea	38	105
illudens	38	108
infundibuliformis	38	112
media	38	116
odora (Fr. var. anisaria)	38	117
pinophila	38	121
rivulosa	38	125
setiseda	38	122
sinopicoides	38	114
sp. (?)	38	105
subnigricans	38	112
tabescens	38	106
tumulosa	38	109
Clitocybes of North Carolina, The Laccarias and	38	98
Clover seeds as related to hardness, Some phases of structure and development of garden pea and white sweet	38	76
Coals, By-producting North Carolina. Abstract	40	114
Utilization of North Carolina	42	126

	Vol.	Page
Coast erosion and shoreline protection. Abstract	43	23
Cobb, Collier. Earthquakes, with special reference to the Japanese earthquake of September 1, 1923. Abstract	40	116
Loess deposits of China	40	191
Loessal soil and the world's food supply. Abstract	41	20
Oil-bearing soft pelite from Ontario, Canada. Abstract	41	18
Permian fossils from the base of the North Carolina newark. Abstract	39	30
Physiographic processes in relation to harbor development and harbor maintenance	38	21
Soil classification. Abstract	42	11
Our changing environment in North Carolina. Abstract	43	13
Soils and civilization. Abstract	43	17
On coast erosion and shoreline protection. Abstract	43	23
A sperm whale from the miocene (?) of Florida. Abstract	43	23
Early Italian maps of American shorelines. Abstract	44	18
Japanese plants around Chapel Hill. Abstract	44	24
Some American pioneers in soil investigation. Abstract	44	49
Cobb, Wm. B. A comparison of the development of soils from acid and basic crystalline rocks. Abstract	43	17
Soil age and its possible significance in geology. Abstract	44	17
Coccinellidae, The genitalia of some of the	42	63
Ceolotes bimucronatus	41	198
hybridus	41	199
plumarius	41	200
Coker, R. E. Breeding habits of Limnoria at Beaufort, N. C	39	95
Plankton collections in Lake James, N. C., copepods and Cladocera	41	228
Some observations on protozoa. Abstract	41	42
Coker, W. C. Further notes on Hydnums	41	270
(With J. N. Couch) Gasteromycetes of North Carolina	38	231
Geasters of the United States and Canada	39	170
(With H. C. Beardslee) Laccarias and Clitocybes of North Carolina	38	98
(With H. C. Beardslee) Mycenas of North Carolina	40	49
New or noteworthy basidiomycetes	42	251
(With P. M. Patterson) New species of Pythium	42	247
(With J. N. Couch) New species of Thraustotheca	39	112
(With H. H. Braxton) New water molds from the soil	42	139
Other water molds from the soil	42	207
(With J. N. Couch) Revision of the genus Thraustotheca, with a description of a new species	40	197
Visit to Lapland and to some old herbaria. Abstract	38	24
New or noteworthy basidiomycetes	43	129
Lars Romell	43	146
The distribution of Venus's fly trap	43	221
Notes on basidiomycetes	43	233

	Vol.	Page
The Chapel Hill species of the genus Psalliota	43	243
Variation in our native ornamental flowering trees. Abstract	44	19
Limits of life. Abstract	44	48
Colds, common, Some investigations into the bacteriology of, and an autogenous vaccine therapy for six months at Wake Forest College	38	14
Collecting trip up Grandfather Mountain, June 16, 1923, A botanical. Abstract	40	108
Collineations belonging to a pencil, Involutory. Abstract	42	21
Collins, Gyfford D., and O. B. Ader. The fraction of the mass of various types of springs which is accelerated in simple harmonic motion. Abstract	44	28
Collins, S. C. A new thermoregulator. Abstract	43	18
Collybia dryophila parasitic on dewberry	43	101
Columns, A proposed new formula for the strength of	43	71
Concrete cylinders as a function of their height, Breaking strength of. Abstract	40	117
Conics, Correlations and systems of. Abstract	43	19
Constitution of the North Carolina Academy of Science	41	1
	44	32
Copepods and Cladocera, Plankton collections in Lake James, North Carolina	41	228
Copperhead snake at Raleigh, N. C. Abstract	39	17
Corn, Variation of protein content of,		
Paper I	38	84
Paper II	39	56
Paper III	40	176
Paper IV	41	64
Paper V	42	113
Cosmocerca dukae	43	185
Cotton by microscopy, Classification of	42	122
Cotton fiber, The structure of. Abstract	43	15
Cotton seed in warehouse storage, Investigation on the germinating and heating of	41	124
Cotton seeds, Two rare types of abnormality in	41	138
Cotylaspis stunkardi	43	195
Couch, J. N. Dioecious water mold (Dictyuchus monosporus)	40	116
(With W. C. Coker) Gasteromycetes of North Carolina	38	231
New dioecious species of Choanephora	41	141
(With W. C. Coker) New species of Thraustotheca	39	112
Notes on the genus Aphanomyces, with a description of a new semiparasitic species	41	213
(With W. C. Coker) Revision of the genus Thraustotheca, with a description of a new genus	40	197
Some new water fungi from the soil, with observations on spore formation	42	227

	Vol.	Page
Some observations on spore formation and discharge in Leptolegnia, Achlya, and Aphanomyces	40	27
A monograph of Septobasidium. Part I. Jamaican species	44	242
Crabs, The ecology of certain estuarine	44	230
Craterellus albomarginatus	43	139
Crepusia glauca	38	173
Cretaceous sandstone quarry near Kinston, N. C. Abstract	44	22
Crimorphus conspicuus	38	212
Crosby, C. R., and S. C. Bishop. Notes on the Opiliones of the southeastern United States with descriptions of new species	40	8
Notes on the spiders of the southeastern United States with descriptions of new species	41	165
Ctenus hybernalis	41	187
Cubic curves, Some types of plane. Abstract	44	27
Cubic with a cusp. Abstract	44	51
Cunningham, Bert. Contributions of experimental embryology to the study of germinal organization	43	26
The occlusion membrane in snakes	43	193
(With W. Stanfield) Some effects of the injection of pituitrin into hens' eggs	44	63
Incubation of hen eggs under increased atmospheric pressure	42	188
(With J. J. Wolfe) Investigation of the microplankton of Chesapeake Bay	42	25
"Keeping Up" with lantern slides	40	189
Notes on protozoa. Abstract	38	9
(With Clara Becton) Occurrence of an ova-testis in Bufo terrestris. Abstract	42	14
Pure culture of diatoms. Abstract	39	10
(With Carrie Hearne) Some Observations upon the reproductive rate of Euglena tripteris and Eudorina	40	185
Some phases in the development of Chrysemys cinerea	38	51
Some rare or new protozoa	44	240
Curvature, Aspects of constant. Abstract	39	12
of manifolds. Abstract	39	18
Cybaeus montavencis	41	201
patritus	41	202
Cyclops leuckharti	41	247
prasinus	41	248
serrulatus	41	248
Cyphella minutissima	43	240
subgelatinosa	43	241
spiralis	43	137
Tsugae	43	138
Dacryomitra glossoides	43	239
Dacrymyces corticoides	43	237
enata	43	237
involutus	43	237

	Vol.	Page
Daphnia arcuata	41	236
Dashiell, J. F. Measurement of intelligence in different social classes. Abstract	38	32
Neglected factor in maze learning. Abstract	40	109
Race differences in temperament. Abstract	40	118
Some experiments in mental set. Abstract	40	106
Study in the direction-sense of animals. Abstract	41	16
Daugherty, J. F. Electrodeless discharge in iodine vapor. Abstract.	42	17
Davis, John H. Studies in the plant ecology of the Mt. Mitchell area. Abstract	43	10
Deitz, R. O., and F. P. Venable. Reaction of methane and also of acetylene upon zirconium tetrachloride	38	74
deLavaud method of making cast iron pipes by a centrifugal process. Abstract	39	36
Denson, Lee A. Drought of 1925	42	109
Meteorological inquiries from the viewpoint of 1795	41	104
Deposits of China, The Loess	40	191
Desmognathus fuscus carolinensis	43	165
fuscus fuscus	43	164
phoca	43	165
quadra-maculatus	43	166
Determinant theorems by vector methods. Abstract	44	27
Development of soils from acid and basic crystalline rocks. Abstract.	43	17
Diaphanosoma brachyurum	41	234
Diaptomus birgei	41	244
Diatoms, The pure culture of. Abstract	39	10
Dichloro- and trichloroacetic acids, The action of amines on. Abstract	40	112
Dictyophara recurva	38	174
Dictyophora duplicata	38	242
Dictyuchus	42	144
achlyoides	42	218
monosporus	40	116
Dictyuchus monosporus, A dioecious water mold. Abstract	40	116
Diet to vitality, The relation of, in one-celled animals. Abstract	44	50
Dietary factor in reproduction. Abstract	43	20
Digestion in Cambarus. Abstract	39	16
Dike, Paul N. Magnetic surveys by the Carnegie Institution. Abstract	40	114
Dioecious water mold (Dictyuchus monosporus). Abstract	40	116
Diospyros virginiana, Dormancy in seeds of. Abstract	38	14
Diplocarpon earliana	39	158
Diploid males in Hymenoptera. Abstract	44	15
Dipoena intrita	41	176
Diptera from North Carolina, Some new wasps (Hymenoptera) and two new	43	199
Direction-sense of animals. Abstract	41	16

	Vol.	Page
Direction trends in maze learning of white rats	43	105
Dormancy in seeds of persimmon (Diospyros virginiana). Abstract.	38	14
Drought of 1925	42	109
Dyes, Bromination of 2-amino-p-cymene and the preparation of derivative azo. Abstract	40	104
Chlorination of 2-amino-p-xylene and certain new azo. Abstract.	40	111
Derived from 5-chloro-2-amino-p-cymene. Abstract	38	10
Some new. Abstract	39	32
Earle, W. R. Simple apparatus and method for the injection of early chick embryos	40	171
Earth pressures, Experimental determination of lateral. Abstract	38	26
Earthquakes, with special reference to the Japanese earthquake of September 1, 1923. Abstract	40	116
Ecological position of the eastern North Carolina pine communities. Abstract	40	103
Ecology of the Mt. Mitchell area. Abstract	43	10
Of savannah plants. I. Campulosis aromaticus. Abstract	41	17
Of certain estuarine crabs	44	230
Ecteinascidia turbinata Herdman, Some points in the bud development of a simple ascidian	39	92
Edwards, C. W. A note concerning the Thompson theories as to the structure of light. Abstract	43	18
Eichleriella pulvinata	43	236
Einstein and DeSitter, The cylindrical and spherical worlds of. Abstract	44	28
Einstein's finite, unbounded universe. Abstract	39	37
Einstein, The new world of the atom and Albert	41	70
Electrical measurements with the vacuum tube, High frequency. Abstract	42	16
Electrodeless discharge in iodine vapor. Abstract	42	17
Electrometer, The modern	41	259
Electron emission from tungsten and iron, Secondary, Abstract	39	19
Electron theory of valence. Abstract	43	19
Elisha Mitchell Scientific Society, Historical sketch of	39	117
Proceedings of:		
250th Meeting	38	21
251st Meeting	38	24
252nd Meeting	38	25
253rd Meeting	38	26
254th Meeting	38	29
255th Meeting	38	30
256th Meeting	38	31
257th Meeting	38	32
258th Meeting	38	33
259th Meeting	39	28
260th Meeting	39	30

	Vol.	Page
261st Meeting	39	33
262nd Meeting	39	35
263rd Meeting	39	36
264th Meeting	39	37
265th Meeting	39	38
266th Meeting	40	113
267th Meeting	40	114
268th Meeting	40	115
269th Meeting	40	116
270th Meeting	40	117
271st Meeting	40	118
272nd, 273rd Meeting	40	120
274th Meeting	41	37
275th–277th Meeting	41	38
278th Meeting	41	39
279th Meeting	41	40
280th Meeting	41	42
281st Meeting	41	44
282nd Meeting	42	19
283rd Meeting	42	20
284th–288th Meeting	42	21
289th Meeting	42	22
290th–293rd Meeting	43	22
294th–297th Meeting	43	23
298th, 299th Meeting	44	48
300th Meeting	44	50
301st, 302nd Meeting	44	51
303rd–305th Meeting	44	52
Embryology of the carnation mite, Some phases of the	42	94
Embryology, Contributions of, to the study of germinal organization.	43	26
Embryos, A simple apparatus and method for the injection of early chick	40	171
Embryos of oats and wheat	44	90
Environment in North Carolina, Our changing. Abstract	43	13
Environmental conditions, Density of the cell sap of plants in relation to	39	63
Epiptera brittoni	38	175
Ether vs. what? Abstract	38	26
Eudorina, Some observations upon the reproductive rate of Euglena tripteris and	40	185
Euglena tripteris and Eudorina, Some observations upon the reproductive rate of	40	185
Euklastus	38	194
harti	38	195
Eurycea bislineata wilderae	43	162
Eurytoma sp., The relation of temperature, light, and humidity to the behavior and longevity of a joint worm parasite	42	99

	Vol.	Page
Evaporated milk. Abstract	43	10
Everett, H. S. Notes on the reproduction of hydra in the Chapel Hill region	38	92
Exidia alba	43	235
candida	43	234
minutissima	43	234
Exidiopsis alba	43	235
Exoascaceae, Cytological studies of the, Taphrina Johansonii and T. deformans. Abstract	43	15
Eye, Efficiency of the, under different intensities of illumination. Abstract	41	38
Facial expressions and how we react to them. Abstract	39	34
Fant, G. W. The development of peach sooty mold at normal and low temperatures	43	217
Progress in the prevention of covered smut of wheat with copper carbonate. Abstract	44	19
Feeding requirement of animals, Calcium content of mixed feeds in relation to the. Abstract	38	12
Fermentation of rare sugars by plant pathogenic bacteria. Abstract.	38	12
Fern, Brown leafspot of leather leaf	42	55
Ferns and flowers of Chapel Hill. Abstract	38	12
Finklea, J. D. High frequency electrical measurements with the vacuum tube. Abstract	42	16
Fishes, Bibliography of. Review	40	203
Flatiodes concisus	38	192
maculosus	38	191
Flax fiber, The structure and development of. Abstract	43	15
Flora of the Tryon region of North and South Carolina. Part I	44	95
Part II	44	
Part III	44	
Flowers and ferns of Chapel Hill. Abstract	38	12
Fomes scutellatus	43	133
Food supply, Loessal soil and the world's. Abstract	41	20
Fossils from the base of the North Carolina newark, Permian. Abstract	39	30
Fossil, Immediate ancestor of our domestic horse found, in Halifax Co., North Carolina. Abstract	39	31
Fossils, Some x-ray studies of. Abstract	44	22
Frequencies in the infra-red spectrum of quartz. Abstract	44	29
Freund, J. Non-protein antigens of the bacteria	42	135
Frogs, "Nature-experiment" on development of, and one on the physiology of sponges. Abstract	38	10
Frothingham, E. H. Research program of the Appalachian Forest Experiment Station	39	70
Fulgoridae of Eastern North America with descriptions of new species	38	139

	Vol.	Page
Fungi from the soil, with observations on spore formation	42	227
Fungi on sourwood, Oxydendron arboreum (L.) DC	41	94
Gall, Phylloxera caryaeseptem, Shimer. Abstract	40	108
Ganoderma ohiensis	43	133
Gasteromycetes of North Carolina	38	231
Gayenna maculata	41	189
Geaster	39	170
arenarius	39	195
asper	39	215
Bryantii	39	212
coronatus	39	205
Drummondii	39	218
fimbriatus	39	200
floriformis	39	203
fornicatus	39	199
Hariotii	39	214
Hieronymi	39	198
leptospermus	39	209
limbatus	39	178
mammosus	39	193
mirabilis	39	188
Morganii	39	181
pectinatus	39	210
radicans	39	186
rufescens	39	196
saccatus	39	182
saccatus var. Walkeri	42	255
Schmidelii	39	213
subiculosus	39	191
trichifer	39	191
triplex	39	176
umbilicatus	39	217
velutinus	39	185
Geasters of the United States and Canada	39	170
Genitalia of some of the Coccinellidae	42	63
Geolegnia	41	153
inflata	41	154
septisporangia	41	155
Geology of the Muscle Shoals area, Alabama	38	88
Geometry, A problem in projective differential. Abstract	39	35
George, W. C.		
Note on pulmonary circulation in vertebrates. Abstract	38	9
(With Dr. W. E. Hoy, Jr.) Somatic chromosomes of the opossum. Abstract	41	38
Some peculiar amoeboid cells in Perophora. Abstract	40	113
Structure of the heart muscle of ascidia. Abstract	40	109

	Vol.	Page
Studies in ascidian blood. Abstract	40	105
The histology of the blood of some Bermuda ascidians. Abstract.	43	25
Giles, I. V., and A. S. Wheeler. New dyes derived from 5-chloro-2-amino-p-cymene. Abstract	38	10
Grafting, Interspecific, using sponge cells	44	82
Grape hybrids, Stems of. Abstract	38	11
Greene, A. R., and F. C. Vilbrandt. Reclamation of crank-case oils. Abstract	43	21
Gyrinophilus danielsi	43	161
Gyroscopic compass, A novel design for a. Abstract	43	24
Hall, F. G., and R. W. Root. The influence of ultra-violet radiations on the blood sugar of the rabbit	43	187
Halverson, J. O.		
(With L. M. Nixon) Calcium content of mixed feeds in relation to feeding requirement of animals. Abstract	38	12
(With L. M. Nixon) McCrudden's volumetric method compared with the Shohl and Pedley method for determination of calcium. Abstract	39	18
(With Earl Hostetler) Results of soft pork investigations. Abstract	41	17
(With Earl Hostetler) Soft pork and its causes. Abstract	40	107
(With Earl Hostetler) Studies on the nutritive value of the peanut: the effect of peanut proteins on growth of pigs. Abstract	41	30
The story of light in the nutrition of animals. Abstract	43	11
A dietary factor in reproduction. Abstract	43	20
Hamlin, Marston Lovell. New vacuum gage. Abstract	39	15
Hammond, W. C., Jr., and F. C. Vilbrandt. Insulation for refrigerators	43	63
Harbor development and harbor maintenance	38	21
Harvey, James Vernon. Brevilegnia diclina	42	243
Study of the water molds and Pythiums occurring in the soils of Chapel Hill	41	151
Heart muscle of ascidia, The structure of the. Abstract	40	109
Hearne, Carrie, and Bert Cunningham. Some observations upon the reproductive rate of Euglena tripteris and Eudorina	40	185
Heck, Charles M. Physical factors in the artificial incubation of eggs. Abstract	39	12
Science of the future and for the future	40	122
Helicobasidium arboreum	44	257
Henderson, Archibald. Aspects of constant curvature. Abstract	39	12
Einstein's finite, unbounded universe. Abstract	39	37
Generalized relativity and the three tests. Abstract	38	32
How Einstein's theory of relativity was verified. Abstract	38	18
New world of the atom and Albert Einstein	41	70
William Cain: Mathematician and Engineer	39	123
The cylindrical and spherical worlds of Einstein and DeSitter. Abstract	44	28

	Vol.	Page
Hepaticae of North Carolina. Abstract	39	11
Herpis australis	38	196
incisa	38	195
Hickerson, T. F. Transition spirals for highways: a new method. Abstract	39	33
Vertical curves of greater flexibility for highways and railroads. Abstract	41	40
A proposed new formula for the strength of columns	43	71
The pound as compared with the "slug" as a unit of mass	43	207
Hicoria mollissima	40	46
Highsmith, J. Henry. Improvements in the high school science situation	40	135
Highways and railroads, Vertical curves of greater flexibility for. Abstract	41	40
Highways: a new method, Transition spirals for	39	33
History notes from Beaufort, Natural. Abstract	39	28
Hobbs, A. W. Breaking strength of concrete cylinders as a function of their height. Abstract	40	117
Hogue, Mary Jane. Contractile vacuoles in amoebae—factors influencing their formation and rate of contraction	39	49
Holl, Fred J. A trematode parasite of Triturus viridescens (Rafinisque). Abstract	43	16
A new trematode from the newt Triturus viridescens	43	181
Two new nematode parasites	43	184
Parasites of North Carolina amphibians. Abstract	44	20
Honey bee, Life and habits of the	41	47
Horse found fossil in Halifax County, N. C., The immediate ancestor of our domestic. Abstract	39	31
Hostetler, Earl, and J. O. Halverson. Results of soft pork investigations. Abstract	41	17
Soft pork and its causes. Abstract	40	107
Studies on the nutritive value of the peanut: the effect of peanut proteins on growth of pigs. Abstract	41	30
Hoy, Dr. W. E., Jr., and W. C. George. Somatic chromosomes of the opossum. Abstract	41	38
Hybrids, Stems of grape. Abstract	38	11
Hydnellum sanguinarium	41	284
Hydnodon thelephorum	41	279
Hydnum albidum	41	278
amarescens	41	274
delicatum	41	277
fennicum	41	272
fuligineo-album	41	276
Hydnums, Further notes on	41	270
Hydra in the Chapel Hill region, Notes on the reproduction of	38	92
Hydrogen sulfide formation by bacteria, Methods for class demonstration of. Abstract	40	107

	Vol.	Page
Hydroids and ascidians, Dedifferentiation in	39	40
Hygrophorus minutulus	43	141
Hyperboloids, Notes on osculating. Abstract	41	29
Ice crystals, Some properties of. Abstract	41	18
Identification trials. Abstract	40	106
Ilex arenicola	40	44
Beadlei	40	45
glabra austrina	40	44
Incubation of eggs, Physical factors in the artificial. Abstract	39	12
Incubation of hen eggs under increased atmospheric pressure	42	188
Industries in North Carolina in 1922, Chemical	39	76
Opportunities for	40	181
Recent developments in	41	115
In 1926—III	43	55
Infinite series and products, Summability of. Abstract	40	109
Infra-red absorption of ice. Abstract	41	39
Inocybe echinata	43	244
Insect survey with comparative data on other animal groups, Progress on state	41	129
Insulation for refrigrators	43	63
Intelligence in different social classes. Abstract	38	32
Involutions in n-ary algebra, General properties of. Abstract	41	26
Iodine in North Carolina public water supplies	44	87
Iodine vapor, The electrodeless discharge in. Abstract	42	17
Ions in mercury vapor. Abstracts	42	17
	44	30
Iron coloration in rocks and minerals	41	135
Isotopes. Abstracts	38	24
	43	24
Ithyphallus Ravenelii	38	241
Ives, J. D. Cave fauna with especial reference to ecological factors	43	84
Jacobi condition for a particular type of problem. Abstract	44	26
Janda, H. F. Capillary moisture in highway subgrades. Abstract	40	118
Japanese plants around Chapel Hill. Abstract	44	24
Jennings, E. DeW., and A. S. Wheeler. The action of amines on dichloro- and trichloro-acetic acids. Abstract	40	112
Kidney by the continued use of alcohol, The changes induced in the. Abstract	38	33
Kidney functions and pathology, The effect of changing the chemical constitution of the blood on. Abstract	40	115
Korstian, C. F. Density of the cell sap of plants in relation to environmental conditions	39	63
Kyser, E. V. Application of hydrogenated oils to the production of transparent soap. Abstract	42	20

	Vol.	Page
The inhibitory action of antiseptics on the activity of pepsin. Abstract	41	43
Cultivation of American peppermint in North Carolina. Abstract	44	23
(With H. R. Totten) Cultivation of bergamot mint in Chapel Hill. Abstract	44	24
The flowers and flower oils. Abstract	44	51
Laccaria amethystea	38	101
laccata	38	100
ochropurpurea	38	99
tortilis	38	102
Laccarias and Clitocybes of North Carolina	38	98
Lachnocladium Micheneri	42	253
pusillum	42	252
Lake, J. L. Search for the ultimate atom	38	35
Lantern slides, "Keeping up" with	40	189
Lapland and to some old herbaria, Visit to. Abstract	38	24
Lasley, J. W., Jr. Coördinate systems in mathematics. Abstract	38	8
Notes on osculating hyperboloids. Abstract	41	29
On the curvature of manifolds. Abstract	39	18
Problem in projective differential geometry. Abstract	39	35
Correlations and systems of conics. Abstract	43	19
On polar curves as covariants. Abstract	44	25
A note on the cubic with a cusp. Abstract	44	51
Laubenfels, M. W. de. Interspecific grafting, using sponge cells	44	82
Lay, Geo. W. Some dangers in specialization	43	43
Lead coating, A new process of. Abstract	39	36
Lehman, S. G. A Cercospora disease of soy beans. Abstract	43	14
(With Frederick A. Wolf) New downy mildew on soybeans	39	164
Pod and stem blight of the soybean. Abstract	38	13
Two rare types of abnormality in cotton seeds	41	138
Leiby, R. W. Twinning and polyembryony in insects. Abstract	39	16
Leiobunum aurugineum	40	14
bimaculatum	40	16
cretatum	40	19
flavum	40	20
speciosum	40	15
uxorium	40	18
Lepiota haematosperma	43	244
Leptolegnia, Achlya, and Aphanomyces, Some observations on spore formation and discharge in	40	27
Leptolegnia eccentrica	42	215
subterranea	41	158
Leurognathus marmorata	43	166
Lewis, Dr. Ivey F. The age and area hypothesis. Abstract	39	38
Liburnia alexanderi	38	209

	Vol.	Page
fulvidorsum	38	210
gerhardi	38	210
shermani	38	207
staminata	38	211
triloba	38	208
unda	38	207
waldeni	38	212
Light in the nutrition of animals. Abstract	43	11
Light, Thomson theories as to the structure of. Abstract	43	18
Limits of life. Abstract	44	48
Limnoria at Beaufort, N. C., Breeding habits of	39	95
Lloyd, Stuart J. Muscle Shoals and chemistry. Abstract	40	120
Lubrication, Some problems in. Abstract	39	28
Longevity of a joint worm parasite (Eurytoma sp.), The relation of temperature, light, and humidity to the behavior and	42	99
MacCarthy, G. R. Colors of silicate minerals. Abstract	42	13
Iron coloration in rocks and minerals	41	135
The origin of folded mountains. Abstract	44	14
Mackie, Ernest L. A proof of the Jacobi condition for a particular type of problem. Abstract	44	26
MacNider, Wm. deB. Changes induced in the kidney by the continued use of alcohol. Abstract	38	33
Effect of changing the chemical constitution of the blood on kidney functions and pathology. Abstract	40	115
Influence of pregnancy on the stability of the acid-base equilibrium of the blood. Abstract	42	19
Magnetic surveys by the Carnegie Institution. Abstract	40	114
Magnolia acuminata ozarkensis	41	269
Maize, Structural anomalies in the embryos of. Abstract	44	19
Maize, Tuckahoe on	41	288
Manifolds, On the curvature of. Abstract	39	18
Maps of American shorelines, Early Italian. Abstract	44	18
Marasmius nigripes	43	142, 242
nucicola	43	242
Martin, A. C. An ontogenetic study of the gall, Phylloxera caryaeseptem, Shimer. Abstract	40	108
Martin, Ella May. Cytological studies of the Exoascaceae. Taphrina Johansii and T. deformans. Abstract	43	15
Mathematics, Coordinate systems in. Abstract	38	8
Matrix, Characteristic equation of a. Abstract	44	48
Matthews, Velma Dare. Nowakowskiella and a new species of Pythium	43	229
Maxwell's theorems of relative displacements. Abstract	41	39
Maze learning, A neglected factor in. Abstract	40	109
McCrudden's volumetric method compared with the Shohl and Pedley method for determination of calcium. Abstract	39	18

	Vol.	Page
Mebane, W. M., and F. C. Vilbrandt. Classification of cotton by microscopy	42	122
Megachile aspera	40	158
audax	40	161
negleca	40	160
rubi	40	159
shermani	40	163
Megachile, Sex anomalies in the genus. Abstract	44	16
Megachiloides oenotherae	40	154
Megamelanus dorsalis	38	199
lautus	38	200
terminalis	38	198
Megamelus aestus	38	202
anticostus	38	204
distinctus	38	201
inflatus	38	203
uncus	38	204
Menhaden fish oil, Studies on deodorizing	42	131
Mental set, Some experiments in. Abstract	40	106
Metcalf, Z. P. A key to the Fulgoridae of eastern North America with descriptions of new species	38	139
Meteorological inquiries from the viewpoint of 1795	41	104
Metschnikoff, zoologist and pathologist. Abstract	38	34
Methane and also of acetylene upon zirconium tetrachloride, Reaction of	38	74
Microledrida flava	38	183
Microphotographic apparatus, A simple. Abstract	39	17
Microplankton of Chesapeake Bay, An investigation of the	42	25
Microstroma juglandis (Bereng.) Sacc	43	97
Migration of animals from the ocean to land and freshwater habitats. Abstract	43	14
Mildew on soybeans, A new downy	39	164
Mills, Dr. J. E. Chemical warfare—methods of attack and defense. Abstract	38	30
Mitchell, Theodore B. New Megachilid Bees	40	154
Sex anomalies in the genus Megachile. Abstract	44	16
Mold (Dictyuchus monosporus), A dioecious water. Abstract	40	116
Molds and Pythiums occurring in the soils of Chapel Hill, A study of the water	41	151
Morphological ecology of savannah plants. I. Campulosis aromaticus. Abstract	41	17
Morse, Mildred, and A. S. Wheeler. Chlorination of 2-amino-p-xylene and certain new azo dyes. Abstract	40	111
Morton, R. J., and Thorndike Saville. Rainfall characteristics of North Carolina. Abstract	39	18
Mosses, Our common. Abstract	44	19
Mountains, Origin of folded. Abstract	44	14

	Vol.	Page
Muscle Shoals and chemistry. Abstract	40	120
Muscle Shoals area, Alabama, Geology of	38	88
Mutinus Curtisii	38	240
Ravenelli	38	239
Mycena acicula	40	78
Adonis	40	75
alkalina	40	88
amabillissima	40	74
ammoniaca	40	89
anomala	40	58
atroalba	40	79
capillaripes	40	64
capillaris	40	70
clavicularis	40	59
corticola	40	68
debilis	40	80
epipterygia	40	61
erubescens	40	55
excisa	40	87
fellea	40	87
filopes	40	80
galericulata	40	84
galopus	40	56
gypsea	40	73
haematopa	40	56
hiemalis	40	69
inclinata	40	81
intertexta	40	82
Iris	40	77
Leajana	40	62
leptocephala	40	89
lineata	40	71
luteo-pallens	40	75
minutula	40	72
pelianthina	40	63
polygramma	40	86
pura	40	70
rorida	40	60
rosella	40	65
rubromarginata	40	64
sanguinolenta	40	57
setosa	40	69
stylobates	40	65
tenerrima	40	66
vulgaris	40	60
Mycenas of North Carolina	40	49
Myndus truncatus	38	184

	Vol.	Page
Myrmekiaphila comstocki	41	168
fluviatilis	41	166
Mysmena guttata	41	177
Necturus, The Water Dogs, of North Carolina	40	166
Nemastoma kepharti	40	24
Nematode parasites, Two new	43	184
Neocenchrea	38	193
Nickel in steels	43	214
Nielsen, Walter M. The formation of negative ions in mercury vapor. Abstract	42	17
The formation of atomic negative ions in mercury vapor. Abstract	44	30
Critical potentials below 4.7 volts for negative ion formation in mercury vapor. Abstract	44	30
Nixon, L. M., and J. O. Halverson. Calcium content of mixed feeds in relation to feeding requirement of animals. Abstract	38	12
McCrudden's volumetric method compared with the Shohl and Pedley method for determination of calcium. Abstract	39	18
North Carolina Academy of Science:		
By-Laws—September, 1925	41	3
Constitution	41	1
Twenty years of	38	46
Proceedings of:		
21st Annual Meeting	38	1
22nd Annual Meeting	39	1
23rd Annual Meeting	40	93
24th Annual Meeting	41	7
25th Annual Meeting	42	1
26th Annual Meeting	43	1
27th Annual Meeting	44	1
Nowakowskiella elegans	43	229
Occlusion membrane in snakes	43	193
Ocoee, The rejuvenated. Abstract	38	33
Odiellus nubivagus	40	21
Oecleus productus	38	184
Oil-bearing shale of North Carolina	41	108
Oils, flower. Abstract	44	51
Oliarus montanus	38	179
texanus	38	180
vitreus	38	180
vittatus	38	181
Oligotropus wilmingtoni	40	156
Ommatius gemma	43	205
Ontogenetic study of the gall, Phylloxera caryaeseptem, Shimer. Abstract	40	108

	Vol.	Page
Opiliones of the southeastern United States with descriptions of new species, Notes on the	40	8
Osmia albohirta	40	164
Ova-testis in Bufo terrestris, The occurrence of an	42	14
Oxydendron arboreum (L.) DC., Some undescribed fungi on sourwood	41	94
Pachyma Cocos, The fruiting stage of the tuckahoe	38	127
Paidisca	41	178
marxi	41	179
Parasites of cats of Wake Forest, N. C., Some intestinal cestode and nematode. Abstract	38	15
Parasites of North Carolina amphibians. Abstract	44	20
Patterson, A. H. Ether vs. what? Abstract	38	26
History and methods of science	39	131
New process of lead coating. Abstract	39	36
Structure of the atomic nucleus. Abstract	41	41
A novel design for a gyroscopic compass. Abstract	43	24
Patterson, Paul M. Fertilization and oogenesis in Achlya colorata	43	108
(With W. C. Coker) New species of Pythium	42	247
Oogenesis in Pythium torulosum	43	124
Our common mosses. Abstract	44	19
Pea and white sweet clover seeds as related to hardness, Some phases of structure and development of garden	38	76
Peach sooty mold	43	217
Peanut, Studies on the nutritive value of the: effect of peanut proteins on growth of pigs. Abstract	41	30
Pearse, A. S. The migration of animals from the ocean to land and freshwater habitats. Abstract	43	14
Arachnids found on Nigerian rodents and insectivores	43	171
The ecology of certain estuarine crabs at Beaufort, N. C.	44	230
Peattie, Donald Culross. Flora of the Tryon region of North and South Carolina. Part I	44	95
Part II	44	141
Part III	44	180
Trillium in North and South Carolina	42	193
Pelite from Ontario, Canada, An oil-bearing soft. Abstract	41	18
Penney, J. T., and H. V. Wilson. Cell behavior in the regeneration of sponges from dissociated cells	44	79
Peppermint in North Carolina, Cultivation of. Abstract	44	23
Pepsin, The inhibitory action of antiseptics on the activity of. Abstract	41	43
Permian fossils from the base of North Carolina newark. Abstract	39	30
Peronospora sojae	39	168
Perophora, Some peculiar amoeboid cells in. Abstract	40	113
Perry, J. W. Iodine in North Carolina public water supplies	44	87
Persimmon, Dormancy in the seeds of the	39	83

	Vol.	Page
Phalangodes acanthina	40	11
laciniosa	40	9
spinturnix	40	10
Phellodon alboniger	41	282
carnosus	41	277
delicatus	43	241
Ellisianus	43	131
graveolens	41	281
putidus	41	284
vellereus	41	283
Phenylsemicarbazide on acetyl acetone, The action of. Abstract	40	110
Phillips, Charles, and W. L. Taylor. Some investigations into the bacteriology of common colds and an autogenous vaccine therapy for six months at Wake Forest College. Abstract	38	14
Photoelectric current with thickness of metal, Variation of. Abstract	38	17
Phrurolithis alarius	41	191
paludivagus	41	192
palustris	41	193
similis	41	193
umbratilis	41	194
Phylloxera caryaeseptem, Shimer, An ontogenetic study of the gall. Abstract	40	108
Physical sciences, Some approaches to fundamental theory of the	44	53
Physiographic processes in relation to harbor development and harbor maintenance	38	21
Pilosace eximia	43	244
Pine communities, The ecological position of the eastern North Carolina. Abstract	40	103
Pissonotus fulvus	38	206
nigridorsum	38	206
speciosus	38	205
Pituitrin injection into hens' eggs	44	63
Plagitura, new genus	43	181
salamandra	43	181
Plankton collections in Lake James, North Carolina—copepods and Cladocera	41	228
Plant communities, Savannah and sand ridge. Abstract	39	14
Plants:		
Notes on Woody, Paper I	40	43
Notes on Woody, Paper II	41	267
Plethodon glutinosus	43	159
jordani	43	159
metcalfi	43	160
shermani	43	160
Plum curculio, Life history of the	43	79

	Vol.	Page
Plyler, E. K. The determination of isotopes by the lines of spectra. Abstract	43	24
Combination frequencies in the infra-red spectrum of quartz. Abstract	44	29
A method of detecting small adiabatic changes. Abstract	44	29
Emission spectrum of CO_2 in a Bunsen burner. Abstract	42	16
Infra-red absorption of ice. Abstract	41	39
Quantum theory and its modern developments. Abstract	42	20
Some properties of ice crystals. Abstract	41	18
Polar curves as covariants. Abstract	44	25
Polyembryony in insects, Twinning and. Abstract	39	16
Polyporus holocyaneus	43	132
umbellatus	43	131
Pompiloides agnema	43	204
Poole, R. F. A variety of Collybia dryophila parasitic on dewberry	43	101
Poria cocos	38	134
	43	135
Pork investigations, Results of soft. Abstract	41	17
Pork, Soft, and its causes. Abstract	40	107
Potassium compounds, Substitution of sodium compounds for	42	118
Potter, Robert D. On some ultra-ionization potentials of mercury vapor. Abstract	44	31
Pound as compared with the "slug" as a unit of mass	43	207
Power investigations on Deep River. Abstract	40	120
Pregnancy on the stability of the acid-base equilibrium of the blood, The influence of. Abstract	42	19
Priocnemis leibyi	43	203
Protozoa, Notes on. Abstract	38	9
Some observations on. Abstract	41	42
Some rare or new	44	240
Prouty, W. F. Age of the ocoee and associated rocks of Clay County, Alabama. Abstract	38	16
Geology of the Muscle Shoals area, Alabama	38	88
Rejuvenated ocoee. Abstract	38	33
Relation of rock character and structure to topography in the central belt of the folded Appalachians. Abstract	41	44
Structural conditions in west central Appalachians. Abstract	41	23
Triassic basin west of Raleigh. Abstract	41	24
Triassic of the Durham basin. Abstract	42	22
Typical structures of central Appalachian area and their relation to topography. Abstract	44	14
Psalliota, The Chapel Hill species of the genus	43	243
abruptibulba	43	243
		247
arvensis	43	243
		252

	Vol.	Page
arvensis var. hortensis	43	243–253
auricolor	43	243–249
campestris	43	243–246
diminutiva	43	243–245
echinata	43	243–244
haematosperma	43	244
placomyces	43	244–255
silvatica	43	244–254
Pseudagenia marionae	43	202
mariva	43	202
najacra	43	203
Pseudemys elonae	44	67
vioscana	44	66
Pyrophyllite deposits of Moore and Chatham counties, North Carolina. Abstract	43	12
Pyrophyllite as an ingredient in ceramic bodies. Abstract	43	13
Pythiopsis intermedia	41	157
Pythium, A new species of	42	247
Pythium papillatum	43	231
torulosum	43	124
Pythiums occurring in the soils of Chapel Hill, A study of the water molds and	41	151
Pyxie, A new, from North Carolina	44	238
Quadratic equations, Method of solving simultaneous. Abstract	42	15
Quantum theory and its modern developments. Abstract	42	20
Quercus Demarei	41	268
leiodermis	40	43
similis	40	43
venulosa	41	268
Race differences in temperament. Abstract	40	118
Radiations lying between the ultra-violet and X-ray spectrum. Abstract	39	38
Rainfall characteristics of North Carolina. Abstracts	39	18
	40	106
	44	15
Randolph, E. E. Investigation on the germinating and heating of cotton seed in warehouse storage	41	124
Opportunities for chemical industries in North Carolina	40	181

	Vol.	Page
Studies on deodorizing Menhaden fish oil	42	131
A study of some North Carolina waste products	43	67
Quality of the surface waters of North Carolina	44	70
Raper, Kenneth B. Studies on the frequency of water molds in the soil	44	133
Reclamation of crank-case oils. Abstract	43	21
Regeneration of sponges from dissociated cells, Cell behavior in the	44	79
Relative displacements, Maxwell's theorems of. Abstract	41	39
Relativity and the three tests, Generalized. Abstract	38	32
Relativity, A non-mathematical interpretation of the theory of	40	138
Relativity was verified, How Einstein's theory of. Abstract	38	18
Reptiles of North Carolina, Revised key and list of the amphibians and	42	75
Reservoirs for power, Financial value of forest cover for protecting. Abstract	42	13
Rhizopogon, Development of the fruit-body of a new parasitic	39	101
Rhizopogon parasiticus	39	101
Rice, Frank E. Evaporated milk, its chemistry and uses. Abstract	43	10
Infant stomachs and colloid chemistry. Abstract	43	20
Robison, G. M. Summability of infinite series and products. Abstract	40	109
Rock character and structure to topography in the central belt of the folded Appalachians, Relation of. Abstract	41	44
Rock thickness, A self correcting formula for the calculation of. Abstract	42	11
Rocks of Clay County, Alabama, Age of the ocoee and associated. Abstract	38	16
Romell, Lars	43	146
Root, R. W., and F. G. Hall. The influence of ultra-violet radiations on the blood sugar of the rabbit	43	187
Rumbold, Dean W. A new trematode from the snapping turtle	43	195
Sabacon mitchelli	40	23
Saccoblastia caroliniana	43	233
ovispora var. caroliniana	43	233
Sarcodon fumosus	43	129
Murrillii	41 43	273 130
Saville, Thorndike. Rainfall characteristics of North Carolina. (With R. J. Morton) Paper I. Abstract	39	18
(With J. H. Wulbern, Jr.) Paper II. Abstract	40	106
Some power investigations on Deep River. Abstract	40	120
Water supply investigations in Venezuela. Abstract	44	50
Scapholeberis mucronata	41	240
Schallert, P. O. Botanical collecting trip up Grandfather Mountain, June 16, 1923. Abstract	40	108
Science, The history and methods of	39	131

	Vol.	Page
Science situation, Improvements in high school	40	135
Scolops parvulus	38	175
Scorch, Strawberry leaf	39	141
Sea-Urchins, Amoeboid behavior of the lymph cells in	40	169
Seismosarca alba	43	235
Selenium from the effect of X-rays, Recovery of. Abstract	42	16
Septobasidium	44	244
alveolatum	44	253
areolatum	44	248
atropunctum	44	251
frustulosum	44	250
jamaicaense	44	246
papyraceum	44	249
Polypodii	44	255
purpureum	44	255
Sex anomalies in the genus Megachile. Abstract	44	16
Shale of southwestern Virginia, The Chattanooga. Abstract	42	13
Shales of Virginia and Tennessee, The Devono-Mississippian black. Abstract	44	20
Sharpe, Lucile. Abnormal embryos of oats and wheat	44	90
Shelton, G. R. North Carolina pyrophyllite as an ingredient in ceramic bodies. Abstract	43	13
Sherman, Franklin. Progress on state insect survey with comparative data on other animal groups	41	129
Sherwin, M. E. Soil treatments to overcome the injurious effects of toxic materials in eastern North Carolina swamp land	39	43
Sherwood, F. W. Relation of diet to the development and preservation of the teeth. Abstract	39	16
Shrubs of the southeastern states	39	110
Shunk, I. V. Methods for class demonstration of hydrogen sulfide formation by bacteria. Abstract	40	107
(With L. A. Whitford) A method for growing yeast ascospores for class use. Abstract	44	15
Signature of a quadratic form. Abstract	44	26
Silicate minerals, The colors of. Abstract	42	13
Simblum sphaerocephalum	38	238
Sirobasidium sanguineum	43	233
Sistotrema confluens	41	285
"Slug" as a unit of mass	43	207
Smith, A. R., and F. C. Vilbrandt. Substitution of sodium compounds for potassium compounds	42	118
Smut of wheat, Prevention of. Abstract	44	19
Snakes at Raleigh, N. C., The seasonal catch of	41	100
Snakes, The occlusion membrane in	43	193
Snyder, Laurence H. Human blood groups: their inheritance and racial significance. Abstract	42	10
X-rays and their biological effects. Abstract	41	19

	Vol.	Page
Snyder, Miss V. E. Comparison of chicks incubated for five days under increased pressure and normal pressure. Abstract	42	10
Soap, Application of hydrogenated oils to the production of transparent. Abstract	42	20
Sodium compounds for potassium compounds, Substitution of	42	118
Soil age and its possible significance in geology. Abstract	44	17
Soil classification. Abstract	42	11
Soil investigations, Some American pioneers in. Abstract	44	49
Soil treatments to overcome the injurious effects of toxic materials in eastern North Carolina swamp land	39	43
Soils and civilization. Abstract	43	17
Soybean, Pod and stem blight of the. Abstract	38	13
Soybeans, A new downy mildew on	39	164
Spathularia clavata	43	143
flavida	43	143
velutipes	43	144
Specialization, Some dangers in	43	43
Spectrum of CO_2 in a Bunsen burner, The emission. Abstract	42	16
Sperm whale from the Miocene (?) of Florida. Abstract	43	23
Sphaerella caroliniana	41	94
Sphaerobolus iowensis n. sp. and Sphaerobolus stellatus Tode, Development and mechanism of discharge in	42	151
stellatus var. giganteus	42	171
Sphaerulina polyspora	41	96
Spiders of the southeastern United States with descriptions of new species	41	165
Spinitectus carolini	43	184
Spirals for highways, Transition: a new method. Abstract	39	33
Spirocheticidal action of arsphenamin (salvarsan, "606"). Abstract	38	31
Sponges, "Nature-experiment" on development of frogs and one on physiology of. Abstract	38	10
Sponges, Regeneration of	44	79
Spore formation and discharge in Leptolegnia, Achlya, and Aphanomyces	40	27
Springs of various types in simple harmonic motion. Abstract	44	28
Stanfield, W., and Bert Cunningham. Some effects of the injection of pituitrin into hens' eggs	44	63
Steccherinum pulcherrinum	41	285
Stenocransus arundineus	38	197
Stereochilus marginatus	43	161
Stomachs, Infant, and colloid chemistry. Abstract	43	20
Stratigraphic correlation, with special reference to the Chattanooga black shale. Abstract	41	22
Strawberry leaf scorch	39	141
Strength of concrete cylinders as a function of their height, The breaking. Abstract	40	117
Structural conditions in West Central Appalachians. Abstract	41	23

	Vol.	Page
Stuckey, Jasper L. The pyrophyllite deposits of Moore and Chatham counties, North Carolina. Abstract	43	12
A cretaceous sandstone quarry near Kinston, North Carolina. Abstract	44	22
Stuhlman, Otto, Jr. Excitation of the O-energy levels in Tungsten by electron bombardment. Abstract	41	20
Modern electrometer	41	259
Radiations lying between the ultra-violet and X-ray spectrum. Abstract	39	38
Secondary electron emission from tungsten and iron. Abstract	39	19
Theory of the audion and its application to the wireless telephone. Abstract	38	28
Variation of the photoelectric current with thickness of metal. Abstract	38	17
An electron theory of valence based on an extension of the Bohr-Stoner electron distribution in atoms. Abstract	43	19
Surface waters of North Carolina	44	70
Swartz, J. H. Age of the universe	42	179
Brief notice of a new radioactive method of determining the age of the earth. Abstract	41	21
Brief notice of two new methods of stratigraphic correlation, with special reference to the Chattanooga black shale. Abstract	41	22
Chattanooga shale of southwestern Virginia. Abstract	42	13
Self-correcting formula for the calculation of rock thickness. Abstract	42	11
Simple proof of the law that the only possible periods of crystal symmetry are 1, 2, 3, 4, and 6. Abstract	41	20
The Devono-Mississippian black shales of Virginia and Tennessee. Abstract	44	20
Some X-ray studies of fossils. Abstract	44	22
Symmetry, A simple proof of the law that the only possible periods of crystal, are 1, 2, 3, 4, and 6. Abstract	41	20
Taphrina Johansonii and T. deformans. Abstract	43	15
Taylor, Haywood M. (With Alvin S. Wheeler) Bromination of 2-amino-p-cymene and the preparation of derivative azo dyes. Abstract	40	104
(With Charles Phillips) Some investigations into the bacteriology of common colds and an autogenous vaccine therapy for six months at Wake Forest College	38	14
Taylor, Wm. Randolph. Observations on Amoebidium parasiticum	44	126
Teeth, The relations of diet to the development and preservation of the. Abstract	39	16
Temperament, Race differences in. Abstract	40	118
Theridion dimachaerum	41	181
imparatum	41	182

	Vol.	Page
Thermoregulator, A new. Abstract	43	18
Thies, O. J., Jr., and H. B. Arbuckle. Variation of protein content of corn. Paper I	38	84
Paper II	39	56
Paper III	40	176
Paper IV	41	64
Paper V	42	113
A zinc spot in the Marsh test	43	50
Thionia quinquata	38	190
Thomas, C. L. Estimation of nickel in steels	43	214
Thraustotheca achlyoides	39	112
primoachlya	40	198
unisperma	42	140
var. litoralis	42	141
Thraustotheca, A new species of	39	112
Thraustotheca, with a description of a new species, Revision of the genus	40	197
Totten, H. R. Development of the fruit-body of a new parasitic Rhizopogon	39	101
Wild ferns and flowers of Chapel Hill. Abstract	38	12
(With E. V. Kyser) Cultivation of bergamot mint in Chapel Hill. Abstract	44	24
Toxic materials in eastern North Carolina swamp land, Soil treatments to overcome the injurious effects of	39	43
Transition spirals for highways: a new method. Abstract	39	33
Transvectants in non-symbolic notation. Abstract	44	25
Traxus	38	189
fulvus	38	189
Trees, The common names of some	39	89
Trematode parasite of Triturus viridescens. Abstract	43	16
Trematode from the newt Triturus viridescens, A new	43	181
Trematode from the snapping turtle, A new	43	195
Tremella albida	43	235
enata	43	237
Triassic basin west of Raleigh. Abstract	41	24
Triassic of the Durham Basin. Abstract	42	22
Trichloroacetic acids, The action of amines on dichloro- and. Abstract	40	112
Trillium catesbaei	42	204
cernuum	42	204
discolor	42	197
erectum forma viridiflorum	42	203
erectum	42	200
erectum var. album	42	201
grandiflorum	42	204
grandiflorum forma roseum	42	205
grandiflorum forma viride	42	205

	Vol.	Page
grandiflorum var. parvum	42	206
Hugeri	42	198
Hugeri forma flava	42	199
pusillum	42	200
sessile forma luteum	42	197
sessile	42	197
simile	42	203
Underwoodii	42	198
undulatum	42	206
Vaseyi	42	203
Vaseyi forma album	42	203
Trillium in North and South Carolina	42	193
Triturus viridescens, A trematode parasite of. Abstract	43	16
Tryon region, Flora of, Part I	44	95
Part II	44	141
Part III	44	180
Tuckahoe on maize	41	288
Tuckahoe, Pachyma Cocos, The fruiting stage of the	38	127
Tungsten by electron bombardment, The excitation of the O-energy levels in. Abstract	41	20
Turnipseed, Marie. Some third order determinant theorems by vector methods. Abstract	44	27
Turpentine, The occurrence of borneol in spruce. Abstract	40	111
Twinning and polyembryony in insects. Abstract	39	16
Ultra-ionization potentials of mercury vapor. Abstract	44	31
Ultra-violet radiations on the blood sugar of the rabbit, The influence of	43	187
Ultra-violet and X-ray spectrum, Radiations lying between. Abstract	39	38
Vacuoles in amoebae, contractile—factors influencing their formation and rate of contraction	39	49
Vacuum gage, A new. Abstract	39	15
Variation of protein content of corn. Paper I	38	84
Paper II	39	56
Paper III	40	176
Paper IV	41	64
Paper V	42	113
Variation of the photoelectric current with thickness of metal. Abstract	38	17
Variation of our native ornamental flowering trees. Abstract	44	19
Venable, F. P. Brownian movements	40	1
Historical sketch of the Elisha Mitchell Scientific Society	39	117
Isotopes. Abstract	38	24
(With R. O. Deitz) Reaction of methane and also of acetylene upon zirconium tetrachloride	38	74

	Vol.	Page
Venturia oxydendri	41	98
Venus's fly trap, The distribution of	43	221
Viburnum Bushii	40	48
rufidulum floridanum	40	47
rufidulum margarettae	40	47
Vilbrandt, Frank C. By-producing North Carolina coals. Abstract	40	114
Chemical industries in North Carolina in 1922	39	76
(With W. M. Mebane) Classification of cotton by microscopy	42	122
Manufacture of beet sugar. Abstract	38	29
Oil-bearing shale of North Carolina	41	108
Recent developments in the chemical industries of North Carolina	41	115
Some problems in lubrication. Abstract	39	28
(With A. R. Smith) Substitution of sodium compounds for potassium compounds	42	118
Utilization of North Carolina coals	42	126
The status of chemical industries in North Carolina in 1926—III	43	55
(With A. R. Greene) Reclamation of crank-case oils. Abstract	43	21
(With L. A. Bass) Asphaltogenic bodies in American lubricating oils. Abstract	43	21
(With W. C. Hammond, Jr.) Insulation for refrigerators	43	63
Viscosities of lubricating oils, Effect of heat upon the. Abstract	41	19
Walker, Leva B. Development and mechanism of discharge in Sphaerobolus iowensis n. sp. and Sphaerobolus stellatus Tode	42	151
Wasps (Hymenoptera) and two new Diptera from North Carolina, Some new	43	199
Waste products of North Carolina	43	67
Water dogs (Necturus) of North Carolina	40	166
Water molds from the soil	42	139, 207
Water molds in the soil, The frequency of	44	133
Water supply in Venezuela. Abstract	44	50
Water supplies, Chemistry in its relation to the state	38	94
Wells, B. W. Ecological position of the eastern North Carolina pine communities. Abstract	40	103
Savannah and sand ridge plant communities. Abstract	39	14
A new pyxie from North Carolina	44	238
Wheeler, A. S. (With E. DeW. Jennings) Action of amines on dichloro- and trichloroacetic acids. Abstract	40	112
(With F. P. Brooks) Action of phenylsemicarbazide on acetyl acetone. Abstract	40	110
(With Haywood M. Taylor) Bromination of 2-amino-p-cymene and the preparation of derivative azo dyes. Abstract	40	104

	Vol.	Page
(With Mildred Morse) Chlorination of 2-amino-p-xylene and certain new azo dyes. Abstract	40	111
(With I. V. Giles) New dyes derived from 5-chloro-2-amino-p-cymene. Abstract	38	10
Research in progress in organic chemistry at the University of North Carolina	38	25
Some new dyes. Abstract	39	32
Whitford, L. A., and I. V. Shunk. A method for growing yeast ascospores for class use. Abstract	44	15
Whiting, Anna R. Genetic evidence for diploid males in Hymenoptera. Abstract	44	15
Williams, C. F. Morphological ecology of savannah plants. I. Campulosis aromaticus. Abstract	41	17
Stems of grape hybrids. Abstract	38	11
Wilson, H. V. Amoeboid behavior of the lymph cells in sea-urchins	40	169
Dedifferentiation in hydroids and ascidians	39	40
Metschnikoff, zoologist and pathologist. Abstract	38	34
Natural history notes from Beaufort. Abstract	39	28
"Nature-Experiment" on development of frogs and one on the physiology of sponges. Abstract	38	10
(With J. T. Penney) Cell behavior in the regeneration of sponges from dissociated cells	44	79
Wilson, J. W. Genitalia of some of the Coccinellidae	42	63
Wilson, R. B. Some intestinal cestode and nematode parasites of cats of Wake Forest, N. C. Abstract	38	15
Wolf, Frederick A. Brown leafspot of leather leaf fern	42	55
Fruiting stage of the tuckahoe, Pachyma Cocos	38	127
(With S. G. Lehman) New downy mildew on soybeans	39	164
Some undescribed fungi on sourwood, Oxydendron arboreum (L.) DC	41	94
Strawberry leaf scorch	39	141
Studies on fermentation of rate sugars by plant pathogenic bacteria. Abstract	38	12
Tuckahoe on maize	41	288
Blight of asparagus fern	43	91
The morphology and systematic position of the fungus, Microstroma juglandis (Bereng.) Sacc	43	97
Wolfe, J. J., and Bert Cunningham. Investigation of the microplankton of Chesapeake Bay	42	25
Wolff, William A. Some phases of digestion in Cambarus. Abstract	39	16
Wood, W. W. Non-mathematical interpretation of the theory of relativity	40	138
Woody plants. Paper I	40	43
Paper II	41	267
Wulbern, J. H., Jr., and Thorndike Saville. Rainfall characteristics of North Carolina. Abstract	40	106

	Vol.	Page
X-Rays and their biological effects. Abstract	41	19
X-Ray spectrum, Radiations lying between the ultra-violet and. Abstract	39	38
Yeast ascospores for class use. Abstract	44	15
Yocum, L. Edwin. Some phases of structure and development of garden pea and white sweet clover seeds as related to hardness	38	76
Zinc spot in the Marsh test	43	50
Zirconium tetrachloride, Reaction of methane and also of acetylene upon	38	74

VOL. 44 APRIL, 1929 No. 2

THE JOHN CREAR LIBRARY APR 9 1929

JOURNAL

OF THE

Elisha Mitchell Scientific Society

CONTENTS

FLORA OF THE TRYON REGION. PARTS II AND III. *Donald Culross Peattie*..... 141

THE ECOLOGY OF CERTAIN ESTUARINE CRABS AT BEAUFORT, N. C. *A. S. Pearse*..... 230

A NEW PYXIE FROM NORTH CAROLINA. *B. W. Wells*..... 238

SOME RARE OR NEW PROTOZOA. *Bert Cunningham*..... 240

A MONOGRAPH OF SEPTOBASIDIUM.—PART I. JAMAICAN SPECIES. *J. N. Couch*..... 242

INDEX TO VOLUMES 38–44..... 261

CHAPEL HILL, N. C., U. S. A.

The Elisha Mitchell Scientific Society

J. F. DASHIELL, President

J. N. COUCH, Vice-President

J. M. BELL, Permanent Secretary

GERALD MacCARTHY, Recording Secretary

EDITORS OF THE JOURNAL:

W. C. COKER, Chairman

A. S. WHEELER

W. F. PROUTY

JOURNAL OF THE ELISHA MITCHELL SCIENTIFIC SOCIETY—Semi-annual. Price, $3.00 per year; single numbers, $1.50. Direct all correspondence to the Permanent Secretary, at the University of North Carolina, Chapel Hill, N. C.

In addition to original papers on scientific subjects, this Journal publishes the Proceedings of the Elisha Mitchell Scientific Society, and the Proceedings of the North Carolina Academy of Science, as well as abstracts of papers on scientific subjects published elsewhere by members of the Faculty of the University of North Carolina.

Editor's Note: Beginning with this volume, the Journal will be issued in two single numbers a year instead of two double numbers.

PUBLISHED FOR THE SOCIETY
BY THE
UNIVERSITY OF NORTH CAROLINA PRESS

The University of North Carolina Press
Announces the Publication of

THE GASTEROMYCETES OF THE EASTERN UNITED STATES AND CANADA

By William Chambers Coker and John N. Couch

A systematic and morphological study of all known species of Gasteromycetes of Eastern North America. Photographs and microscopic details are given for nearly all species, and in the majority of cases the studies were made from living material. A number of new species are described, mostly from the subterranean group. The book is the first to present this large and very varied series of fungi as they appear in America.

While a number of the genera are not popularly known, others have always attracted attention on account of their peculiar and highly attractive form —puffballs, earth stars, bird's nest fungi, stinkhorns, pretty-mouths, etc. The keys have been carefully worked out in as practical a way as possible, to simplify the determination of the species.

8" x 11" in size, with 73 photogelatine plates, 29 half tones and 18 zinc line drawings. Postpaid, $12.00.

CHAPEL HILL, NORTH CAROLINA